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Construction Methods

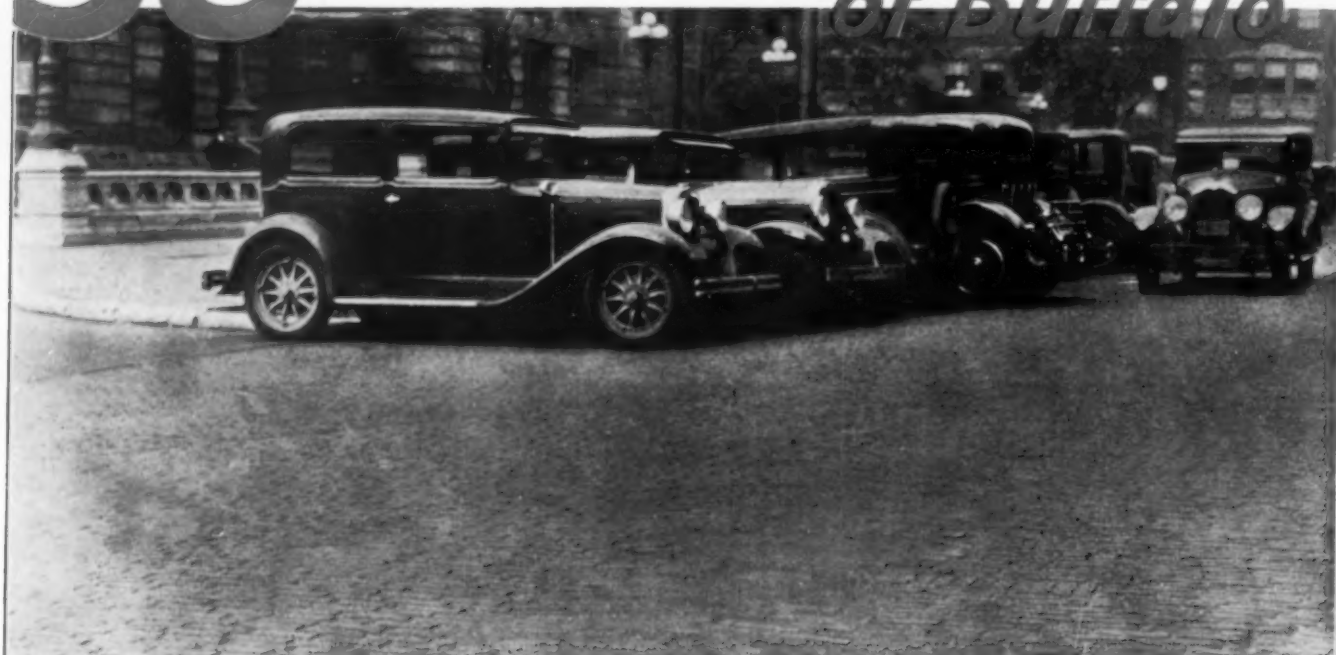
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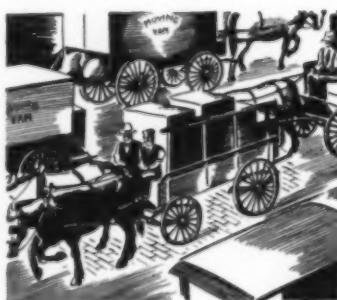
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IN 1893, this brick pavement was put down in the heart of Buffalo. Automobiles presented no problem. High speed busses and trucks were not even thought of. Franklin Street was paved to withstand the "heavy" traffic conditions of the horse and carriage—of the slow speed dray. ♦♦ Yet today that brick pavement—subject to conditions which never flashed across the mind of the engineer who specified it—is still economically serving the people of Buffalo. ♦♦ And as for the maintenance cost, municipal records prove it to be 1¢ per square



yard annually—which is high for a Brick Surfaced Pavement in Buffalo, but far under the record of other paving materials. ♦♦ This is just an example of how Brick Surfaced Pavements last—even under

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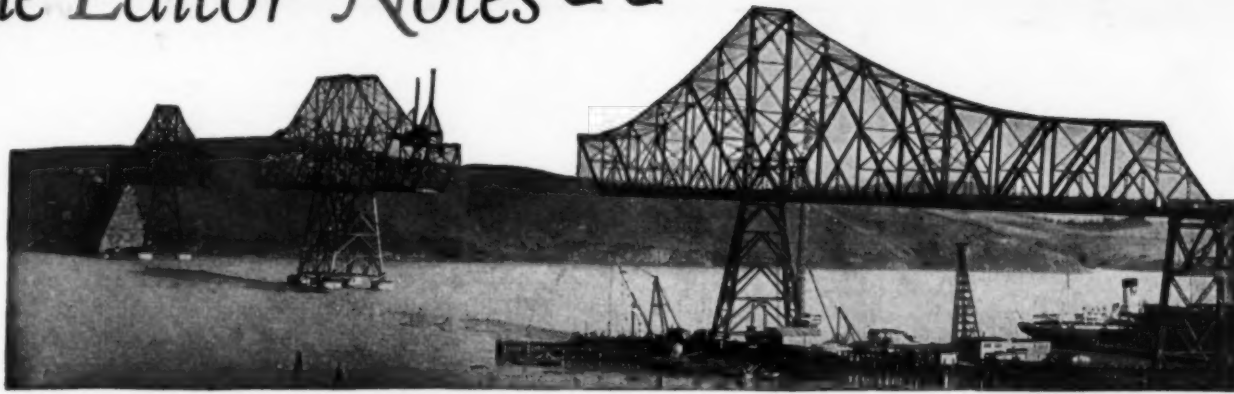
BRICK PAVEMENTS

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TECHNOLOGY DEPT.

July, 1931—CONSTRUCTION METHODS

The Editor Notes --



Terra Cotta in a New Role

TWO unusual architectural and structural features characterize the new 33-story McGraw-Hill building, New York City, described in this and last month's issues of *Construction Methods*. For the first time on an extensive scale in skyscraper construction color has been made the dominant element. On all of its four sides the building presents façades of a bluish-green shade, in striking contrast with the more conventionally sombre colors of other New York skyscrapers. This color, let it be understood, is not applied in the form of a paint or stain on the exterior walls but is rather built into the structure through the medium of glazed terra-cotta blocks used to face the spandrels at each story. As designed by Raymond Hood, Godley & Foulhoux, the architects, the horizontal bands of blue-green terra cotta form a striped façade of striking appearance.

For the construction man the chief point of interest is the application of terra cotta to a structural service ordinarily performed by brick or stone masonry. It is true, of course, that colored terra cotta has been used to some extent in building construction to produce desired architectural effects, but the McGraw-Hill building is believed to be the first skyscraper in which a color serves, not as a detail, but as an outstanding feature. While the use of terra cotta for exterior surfacing on such a large scale is decidedly out of the ordinary, the masonry crew of Starrett Brothers & Eken, Inc., the contractors, encountered no particular difficulties in handling and setting the colored blocks. The pieces, of course, have to be handled a little more carefully than brick to prevent chipping of the glazed exterior surfaces.

The blocks are set up in ordinary mortar and are tied in to a brick wall backing with ribbed metal anchors, the

CONSTRUCTION METHODS

A monthly review of modern construction practice and equipment

ROBERT K. TOMLIN, Editor

Editorial Staff

VINCENT B. SMITH NELLE FITZGERALD
J. I. BALLARD (San Francisco)

WILLARD CHEVALIER, Publishing Director

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Tenth Avenue at 36th Street, New York

lower courses of the terra cotta block being supported by shelf angles, extending outward from the lower flanges of the spandrel I-beams. A special feature of the blocks, which have their surfaces trued up by machine grinding, is "feathered" ends which, when filled with mortar, form a tightly locked joint with the adjacent block.

One other feature of the building is worthy of note. The exterior columns of the structure are faced with steel sheets, painted a greenish-black, thus providing vertical elements contrasting with the lighter blue-green horizontal bands of the terra cotta spandrel facing.

The structure, therefore, represents a departure from conventional skyscraper practice in several of its important details.

World's Longest Suspension Span

Bids were received last month for the Golden Gate suspension bridge across San Francisco Bay, a structure having a main span of 4,200 ft., longest in the world, exceeding by 700 ft. the main suspension span of the George Washington bridge across the Hudson River between New York and New Jersey. Construction of the record-breaking Pacific Coast structure will be under way this summer and will be financed by a \$35,000,000 bond issue approved by the voters last November. The low bid for the structure amounts to about \$24,000,000.

Road Markings for Air Traffic

SINCE paved highways have long been used as landmarks by pilots of aircraft flying cross-country, the Aeronautics Branch of the Commerce Department has dispatched letters to each of the forty-eight state highway commissions, requesting their aid in adopting marking methods that are distinguishable from the air. The importance attached to highways as aids to air navigation is indicated by the fact that the new series of sectional airway maps issued by the Government show the routes of federal and state highways and give their official numbers. A uniform method of marking highways as an aid to air navigation is urged by the Commerce Department. The markings recommended for this purpose are simple, involving in each case the official route number preceded by the letters "U.S." for federal highways, or by the state abbreviation for state highways. Characters should be from 10 to 30 ft. in length. It is also recommended that an effort be made to obtain a color of paint that will contrast as much as possible with the color of the paving. Road builders, constructing routes for vehicles that travel on wheels, now have an opportunity to extend their service to the traffic that moves through the air.

Detroit Gets Next Road Show

The twenty-ninth annual convention and road show of the American Road Builders' Association will be held in Detroit, Jan. 9 to 15, 1932. The decision as to the location of the road show was made last month by association officers after consideration of the advantages of several large cities. The Detroit Airport building will be used. All exhibit space is on the ground floor and the huge doors make possible the setting of the largest equipment.

Longer and Longer Chances

RIGHT now the wise constructor is taking stock of his working plant; he suspects that deferred replacement may have sapped some of his driving power.

He knows that in his business driving power is earning power. The way to profit is through a hard-hitting organization driving powerful plant to its capacity every possible hour of every possible day. And modern construction equipment is built for just that exacting service.

But, so driven, there is an economic limit, and many constructors who have been postponing replacement of their equipment during the past year now realize that they are taking longer and longer chances. They have aimed to "get by" with the old plant; they have crowded its factor of safety and its normal life. But, one of these days will come a little heavier load, a little harder push, and then—!

And by many of the signs, this heavier load may come sooner than we have been expecting. A heavy public works program already in hand, plus a rise of private and industrial construction volume just a little nearer to normal may put many constructors in a position where breakdowns, shut-downs and repairs would be a costly business—perhaps, as prices go today, the difference between profit and loss.

All of which is to suggest to construction men everywhere that this is a good time to look after replacement of worn and obsolete plant. Full-power, full-strength, full-capacity is the only safe basis on which to approach the construction program ahead of us.

Take a good look through the pages of this issue of *Construction Methods*—advertising as well as reading. They may suggest items on which you will want to check up your present plant.

Willard Chevalier

Publishing Director

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WHEN your requirements call for as much as 320 cu. ft. capacity in a portable air compressor, that is the time you are most likely to appreciate a compressor that *really is portable*—one that can easily be moved around on the job to follow the tools, or hauled readily from one job to the next.

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Since "Air Cooling" thus eliminates from 1½ to 2½ tons of dead weight of castings and cooling water, your men can take the 320 cu. ft. Davey Compressor into places no other big compressor can go; *they can handle it just as easily and move it around just as readily as they can any ordinary 160 cu. ft. unit.*

As in all Davey Compressors, "Air Cooling" assures more dependable operation because of the absence of bulky and complicated parts needed for water cooling. Simple, rugged design, with fewer parts and stronger parts. "Air Cooling" retards carbon formation; cuts out delays and cost of carbon removal, makes certain that your compressor will always deliver full pressure and volume of air.

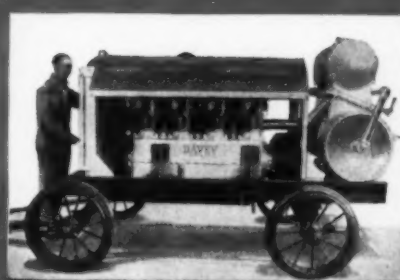
Whether your work calls for trailer, truck or tractor mounting, a 110 cu. ft. compressor, a 320 cu. ft. compressor or a size in between, be sure to inspect the Davey Compressor that fits your job. Compare its unusual portability, its fine engineering, its simplified construction with what has heretofore been accepted as standard in portable air compressors. Ask us where you can see the Davey Compressor. Use the coupon.

DAVEY COMPRESSOR COMPANY, INC., KENT, OHIO

Sales Representatives in all Principal Cities

The method of cooling air compressors through the use of metals of high heat conducting quality and capacity, as contained in Davey Compressors, is fully protected by patent.

DAVEY 
Compressors



As with all Davey Compressors, you crank *only* the engine to put this 320 cu. ft. Davey unit to work; with engine running the compressor starts pumping air with a single throw of the clutch lever. No skinned knuckles or strained backs—you can figure for yourself the time your men save, especially on a cool morning!

This 320 cu. ft. Davey Compressor "runs like a watch," compressor torque is divided over four cylinders instead of two, cutting down sudden strains and vibration, smoothing out the pumping load, adding years to life of compressor and engine. Heavy balanced crank-shaft, ribbed aluminum crankcase, oversize bronze and Timken bearings, full force feed lubrication, the most expensive and efficient type of oil filter and air cleaners—only in Davey Compressors do you get all such details of modern automotive-type engineering.



ONE of the largest light and power corporations (name on request) bought two 320 cu. ft. Davey "Air Cooled" Compressors for their own construction work, because, after experience with water-cooled machines they found these Davey units the only compressors of their capacity that were practical to take out on the job in country like this. On their own statement, until they bought these 320 cu. ft. Davey Compressors, 240 cu. ft. compressors were the largest units they could consider for this operation.

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CM 7-31

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There is an "equatorial line"—far from imaginary!—that marks the difference between profitable and unprofitable motor truck operation. Above it, trucks make money for their owners. Below it, they bleed the profits from the business.

For twenty-five years, Louis Petrossi has been a general contractor in Hartford, Connecticut. He has used many makes of motor trucks and has made money with them. He recently purchased his first Autocar, choosing the Model C, specially built for contracting dump work and rotating concrete mixers . . . His "equatorial line" of profit has suddenly jumped to a new level. His Autocar has set a new standard. He writes, I did not think there was a truck built that would do the things this Autocar is doing and do them so well at such a low operating cost." . . . Even after 25

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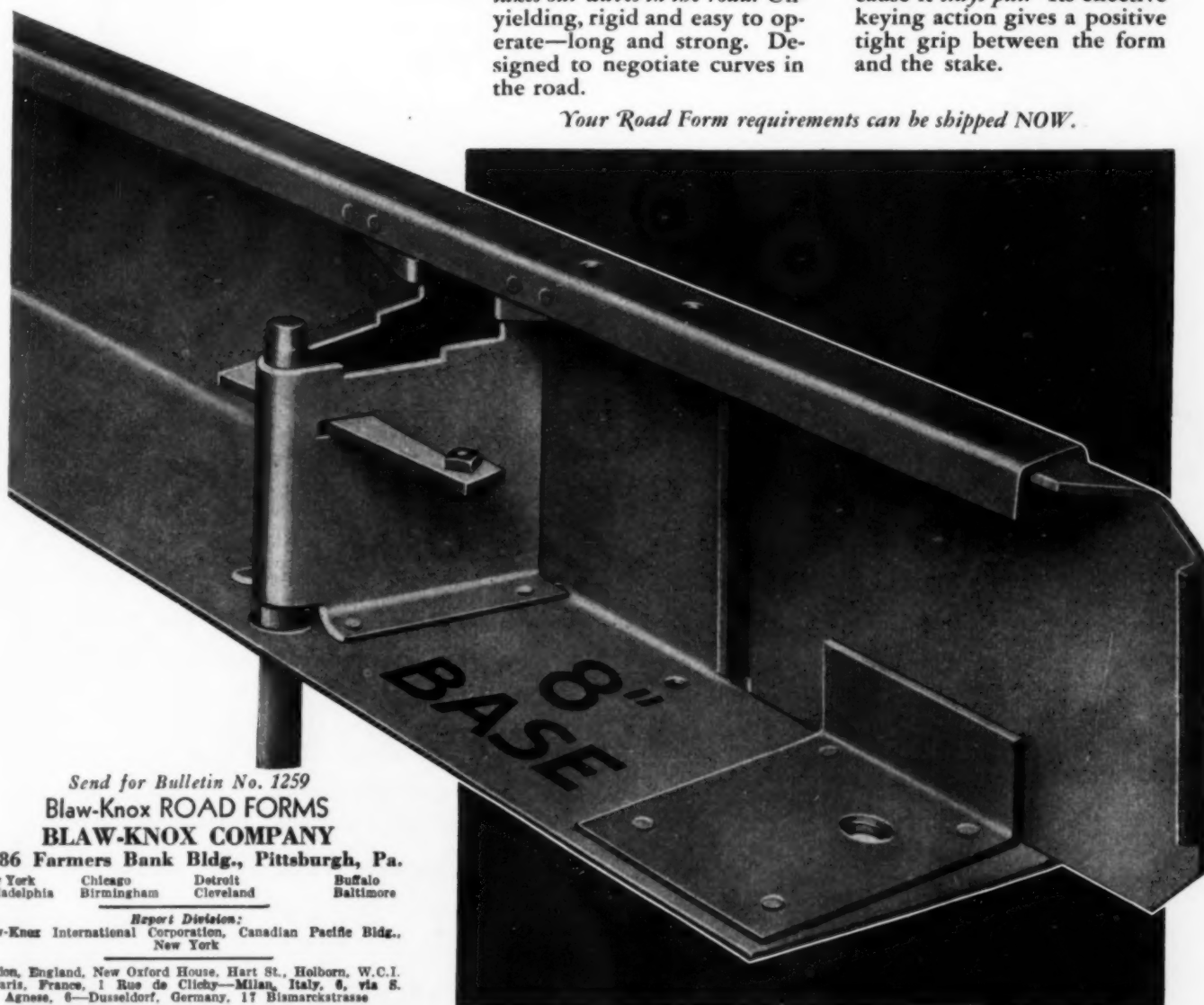
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3
3-1/2
4
4-1/2
5 and
up to
16
yards

Shovels

Drag-
lines

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shells

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The forging furnaces, too, will be Worthingtons... and the channel will be drained with Axiflo Deep Well Pumps.

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Tough digging in all kinds and variations of rock, including volcanic, is encountered on the job.

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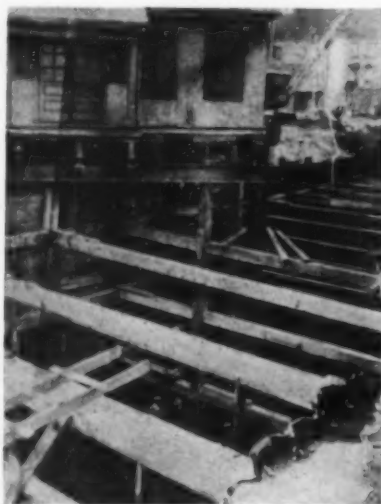


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5000 tons of Lackawanna Arched-Web Piling Section AP 16 were used in sheeting the open cut for the construction of Brooklyn Subway, Route 107, Section 10. The steel sheet piling was driven in 30-foot lengths through filled sandy earth, and cross braced with timber. The ground water level was approximately 12 ft. below the surface of the fill.

Lackawanna Piling Section AP 16 is particularly suited for work of this character, where a narrow wall is required, as it can be driven with all of the arches on the same side of the piling wall. This results in a minimum of waste excavation and a saving in concrete, when poured against the piling wall.

Lackawanna Section AP 16 is 16 in. wide, has a uniform web-sec-



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BETHLEHEM



Preliminary Work on the Hoover Dam

In the Black Canyon of the Colorado River where the great Hoover Dam will be built. The shovel, which is used by the Six Companies, Inc., for making a railroad grade, was furnished equipped with "HERCULES" (Red-Strand) Wire Rope.

Dependable—Economical

Because "HERCULES" (Red-Strand) Wire Rope is uniformly dependable and economical, it is a universal favorite with all whose work requires the use of heavy duty material-handling equipment. While it is a "big job" rope, it provides the same ratio of economy on the smaller jobs, as has been fully demonstrated by its service record.



"HERCULES" (Red-Strand) Wire Rope is long-lasting because all of the materials that go into it—wire, core, and lubricant—are of the very highest quality; moreover, our methods of manufacture are such as to insure even tension on both the wires and the strands, which means that every wire and every strand does its full and equal part.

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AUTOMATIC DIPPER TRIP. Engine trips the dipper. Not necessary for operator to take hands off controls. Good for 10 truck loads more a day.

EASY ON THE OPERATOR. Saves operator's muscle by making the engine engage the clutches. Engine clutch control at operator's position. Saves steps and gas. Automobile type pedals as comfortable as an old pair of shoes.

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Patented greenhorn on end of stick enables using every inch of its length.

PRECISION 2 SPEED HOIST LINE CONTROL. High speed in hoisting crane loads. Low speed moves the load a fraction of an inch per second for precision placing.

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PARTS SERVICE. At Lorain, 96% of telegraphic orders and 92% of all orders shipped within 24 hours. Local parts depot service throughout the United States.

All parts are machined and assembled to jigs, fixtures and templates to insure uniformity and easy interchangeability.

EXTENDED TRUCKS. One standard truck, variable in length, to suit ground conditions.

SIMPLIFIED CONTROLS. In the shovel: 3 levers, only 1 foot pedal. In the crane: 2 levers, 2 pedals. With only these controls to handle, operators can show real speed.

LORAIN 6 POINT CAB. All steel. New comfort and coolness, new visibility, new convenience and safety. And it's the smartest looking of them all.

2 SPEED CENTER DRIVE CRAWLER. Famous for low maintenance cost because of simplicity of moving parts.

2 speeds in either direction with equal efficiency. Double the power ratio in low gear for tough going.

Propelling mechanism runs in a constant oil bath.

4 through axles to carry the weight, any one of which can do it alone.

No dead weight on any propelling shaft.

THEW LORAIN 45-55-75



THOROUGH INSPECTION. 89 tests and inspections of each machine.

A SHOCK ABSORBING FAIRLEAD. Automatic straight lead from guide sheave to bucket. Saves cables.

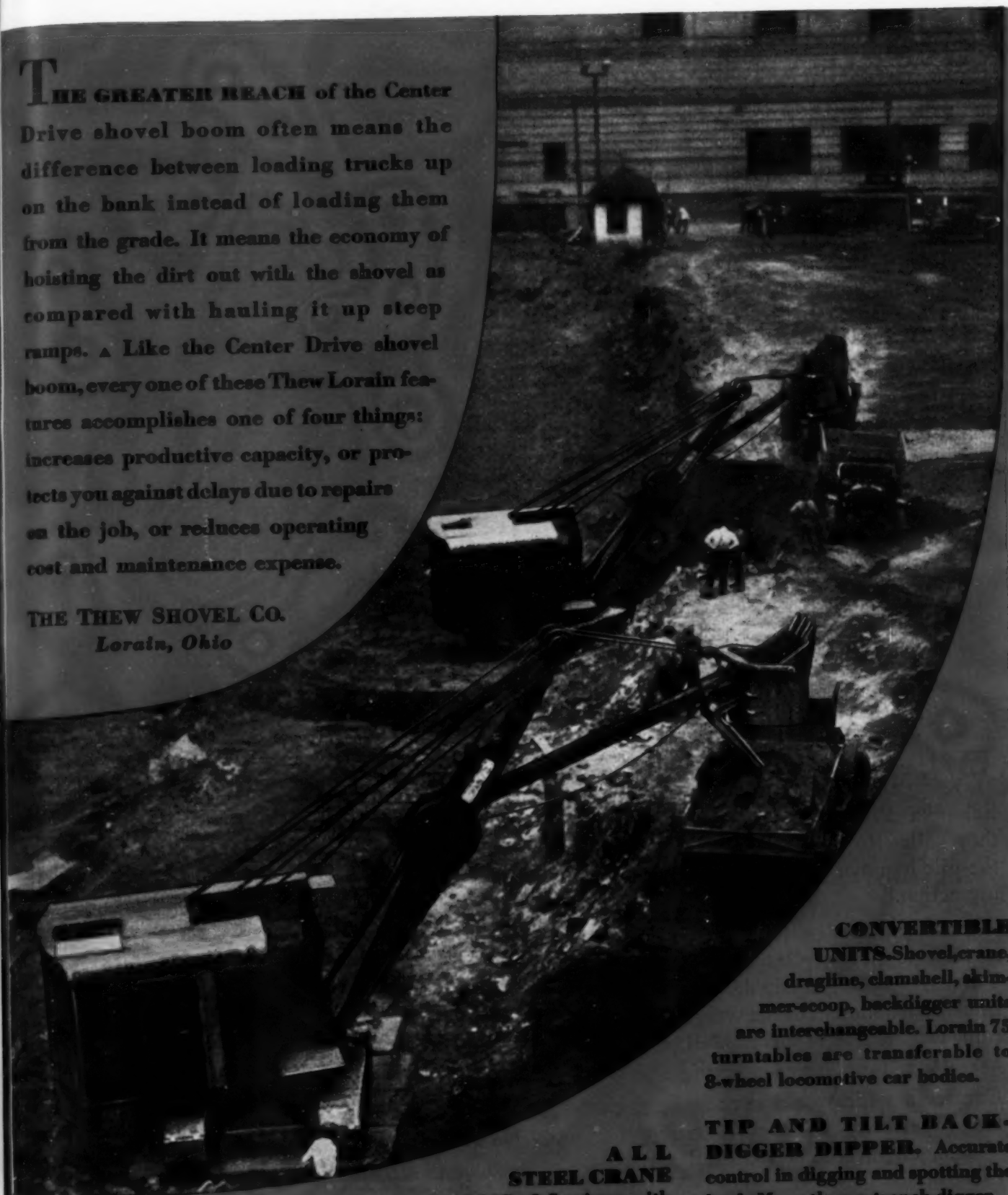
AUTOMATIC CROWD BRAKE. Automatically holds the stick extended without attention from the operator.

GAS, DIESEL, ELECTRIC POWER. Without changes in the basic Center Drive design.

CENTER DRIVE CROWD. The power that propels a Lorain machine with all its tons of steel at 1½ miles per hour, can be concentrated directly to the crowd motion when the machine is digging.

THE GREATER REACH of the Center Drive shovel boom often means the difference between loading trucks up on the bank instead of loading them from the grade. It means the economy of hoisting the dirt out with the shovel as compared with hauling it up steep ramps. ▲ Like the Center Drive shovel boom, every one of these Thew Lorain features accomplishes one of four things: increases productive capacity, or protects you against delays due to repairs on the job, or reduces operating cost and maintenance expense.

THE THEW SHOVEL CO.
Lorain, Ohio



CONVERTIBLE UNITS. Shovel, crane, dragline, clamshell, skimmer-scoop, backdigger units are interchangeable. Lorain 75 turntables are transferable to 8-wheel locomotive car bodies.

TIP AND TILT BACK-DIGGER DIPPER. Accurate control in digging and spotting the load. More than a trench-digger—an all round excavator.

INTERCHANGEABLE LAGGING. Flexibility that gives extra speed for easy digging—extra power for tough digging.

SWING BRAKE. Quicker, more accurate swing control.

CENTER DRIVE SIMPLICITY. Fewer shafts and gears, fewer moving parts to wear.

ALL STEEL CRANE BOOMS. 2 Sections, with intermediate middle sections—gooseneck top sections.

POSITIVE CHAIN CROWD. Made of special heat treated alloy steel. Self adjusting to all boom angles.

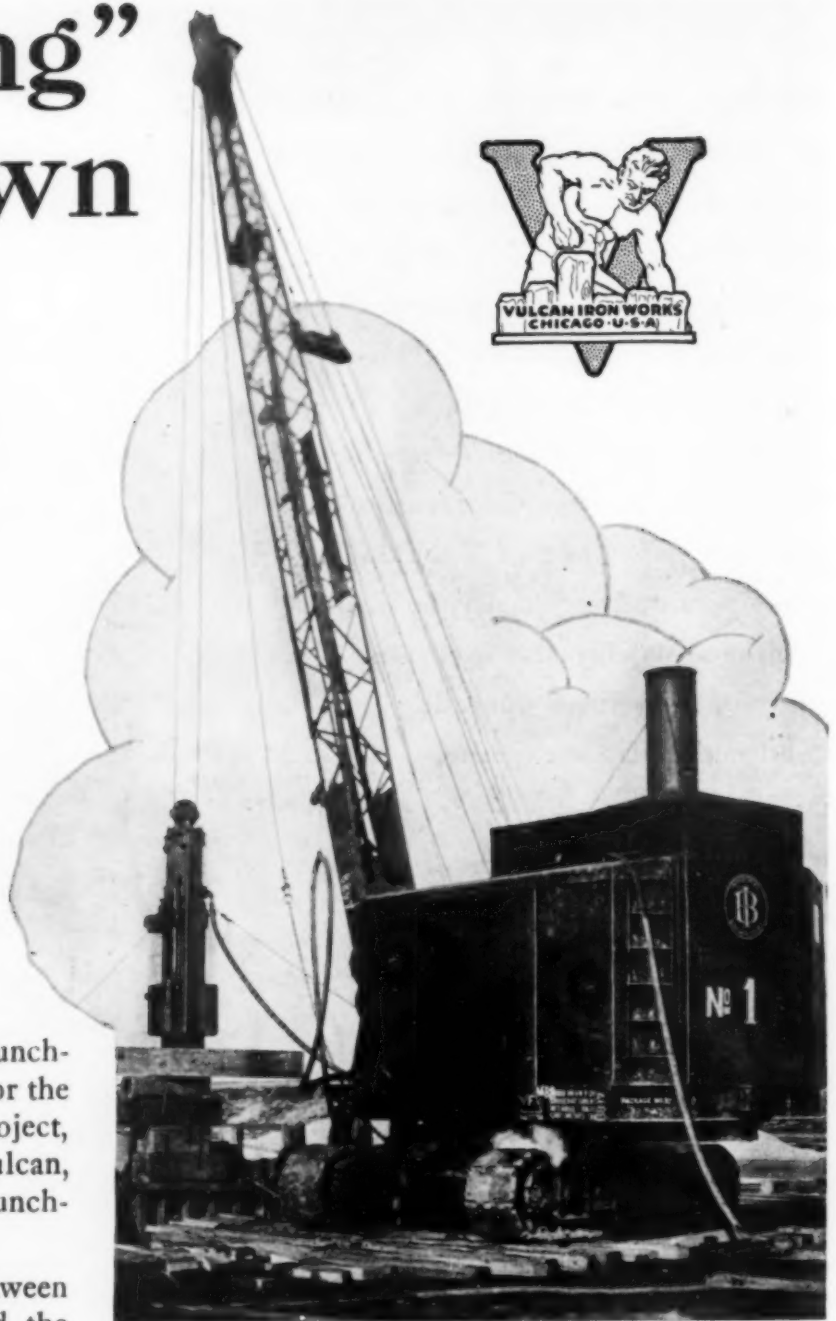
"Punching" them down

on the Salonika Plain

WHEN they wanted real punching ability in a pile driver for the Salonika Plain Reclamation Project, they called for a Warrington-Vulcan, the pile hammer with the true "punching action."

There's a vast difference between merely pounding piles down and the Vulcan punching method. The scientific apportionment of the weight of the ram to the height of its fall is the answer.

Contractors the world over recognize the superiority of the Warrington-Vulcan engineered design and sturdy construction. No Warrington-Vulcan has ever worn out.



The Warrington-Vulcan in use at the Salonika Plain Reclamation Project in Greece by the Foundation Co., New York.

VULCAN IRON WORKS
327 No. Irving Avenue, CHICAGO, ILLINOIS

Southern Representatives:
Woodward, Wight & Co., Ltd., 451 Howard Avenue, New Orleans, La.
Representatives for California, Nevada and Japan:
Harron, Rickard & McCone Co., 1600 Bryant St., San Francisco, Calif.
Representative for the States of Washington and Oregon:
A. H. Cox & Co., Inc., 1757 First Avenue, S., Seattle, Wash.

Warrington-Vulcan



No. 10 of a series of advertisements on "How Superlative Quality is Built into Roebling Wire Rope."

Nothing is left to Chance

NOT even a single wire in a reel of Roebling Steel Wire Rope is an "unknown quantity." Even years after shipment, its complete manufacturing history is retained in the Roebling files. At any time, Roebling can trace right back to the very heat of steel from which the wire was made.

In the testing laboratories, a typical view of which is shown above, *every* bundle of wire is painstakingly tested. Gauging, tension,

torsion and elongation tests are made on samples of wire clipped from each bundle. No wire which does not meet the exacting Roebling standards is used for Roebling Wire Rope. For example, when testing the wire, only that which attains the very highest rating is set aside for stranding.

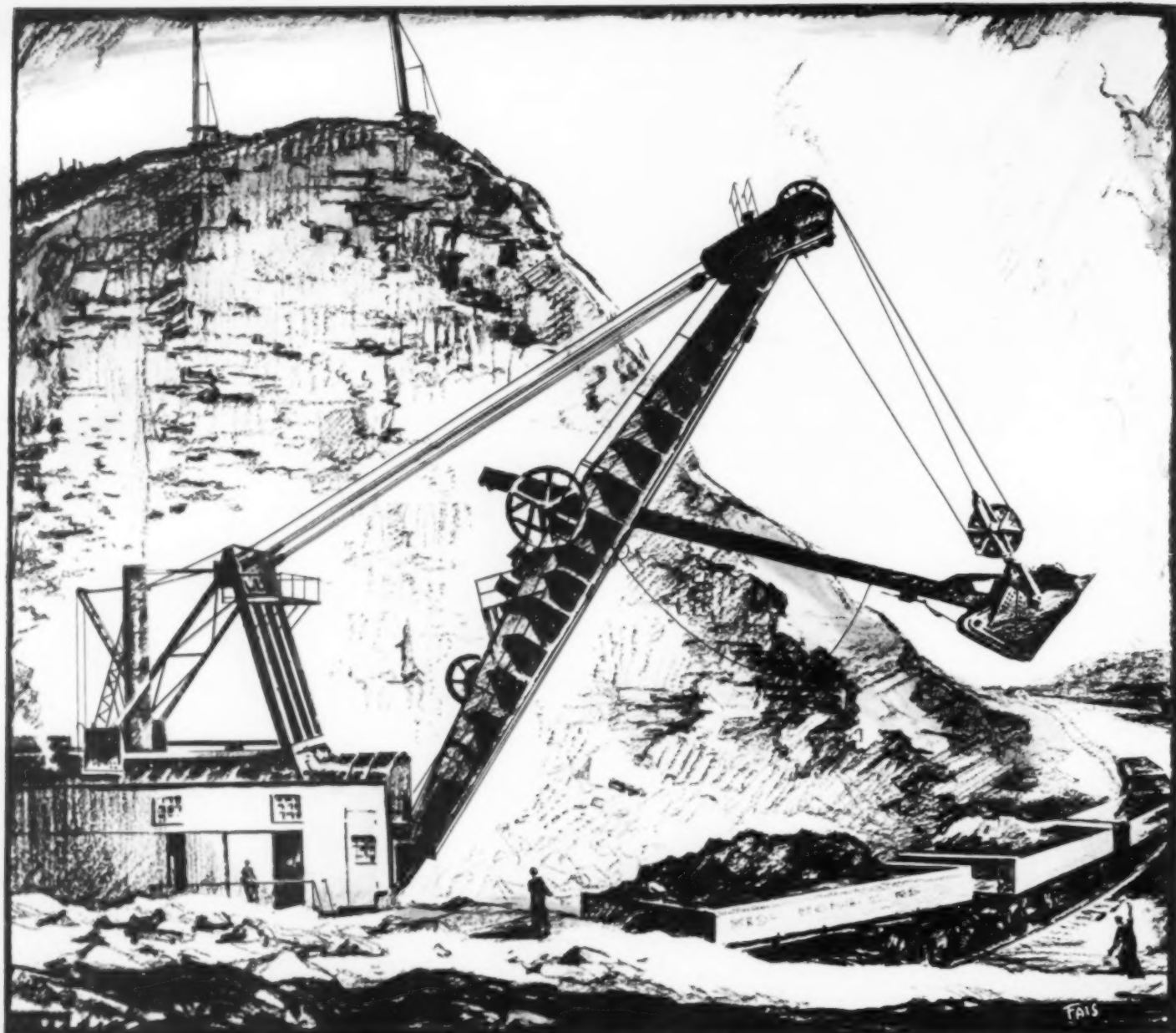
When you order a reel of Roebling you get more than merely so many feet of wire rope. You get predetermined quality, known stamina, safety—of the highest degree.

ROEBLING



"BLUE CENTER"
STEEL

WIRE ROPE



5,275,000 cubic yards of "fill" material are being dug and moved by Winston Bros. Co., Minneapolis, Minn., for Cincinnati's new \$30,000,000 Union Terminal. Practically all shovels and drills used on this job are Roebling Equipped.

On Cincinnati's \$30,000,000 Job

CINCINNATI is building another landmark! It is the new Union Terminal—a great \$30,000,000 project which will require from two to three years for completion.

Making the fill for this terminal is in itself a gigantic job. 5,275,000 cubic yards of material must be dug and moved—and much of the digging is in rock. Equipment that will keep on the job—that will stand up under punishing service without "calling quits"—is therefore essential.

To insure long rope life, to guard against breakdowns and costly interruptions, Winston Bros. Co. have made Roebling "Blue Center" Steel Wire Rope standard equipment for the shovels and drills used for this work. With a few exceptions Roebling Rope is used exclusively. Roebling "Blue Center" spells maximum safety and economy.

JOHN A. ROEBLING'S SONS CO., TRENTON, N. J.

WIRE...WIRE ROPE...WELDING WIRE...FLAT WIRE
COPPER and INSULATED WIRES AND CABLES
WIRE CLOTH and WIRE NETTING

Branches in Principal Cities Export Dept.: New York

ROEBLING



"BLUE CENTER"
STEEL

WIRE ROPE

THE EXTERIOR of the McGRAW-HILL BUILDING

West Forty-second Street, New York, N. Y.

The attention of the engineering profession is called to the Glazed Terra Cotta exterior wall construction of the McGraw-Hill Building.

The outstanding features of this new type of exterior construction are —

The Terra Cotta ashlar blocks are of accurate standard size 8" x 1' 4". Large units—few joints—quickly erected.

Patented End block construction—permitting spreading of mortar and tight interlocking mortar clinch vertical joints.

Color—the Glazed and Vitreous colors commercially produced are limitless in range — and include metallic surfaces, gold, silver, aluminum, bronze, etc.

All ashlar delivered to scaffold in heavy individual cartons—no chipping—low handling cost.

TERRA COTTA will give character and permanent color quality to your concrete building — spandrels, panels, sills.

FEDERAL SEABOARD TERRA COTTA CORPORATION

10 EAST 40TH STREET

NEW YORK, N. Y.

SEND THIS COUPON NOW

Federal Seaboard Terra Cotta Corp.
10 East 40th Street, New York, N. Y.

Send me general information including
specification data and contraction plates.

NAME _____

ADDRESS _____



REO QUALITY IN THE LOWEST PRICED TRUCK FIELD

NEW $1\frac{1}{2}$ TON REO

***... with a wide range of
Reo bodies to fit your needs***

In the entire field of low price trucks, only the new $1\frac{1}{2}$ -Ton REO SPEED WAGONS embody all these excellent features:

Powerful 4 and 6 cylinder truck engines with *five* and *seven* bearing crankshafts; maximum piston displacements; full force feed oiling even to the piston pins; chrome nickel cylinders that wear seven times longer; extra large 7" deep frames; full floating rear axles; long, heavy springs; Spoksteel wheels; and large internal, self-equalizing hydraulic brakes!

Wheelbases are longer, with greater loading spaces back of the cab. With this sturdy chassis, Reo is prepared to supply every popular type of panel, stake, express or dump body—also special types for special needs. Prices are low and quality extraordinary.

A drive under load—over test routes of your own choosing—will tell more about the smooth, powerful action of these new

\$625

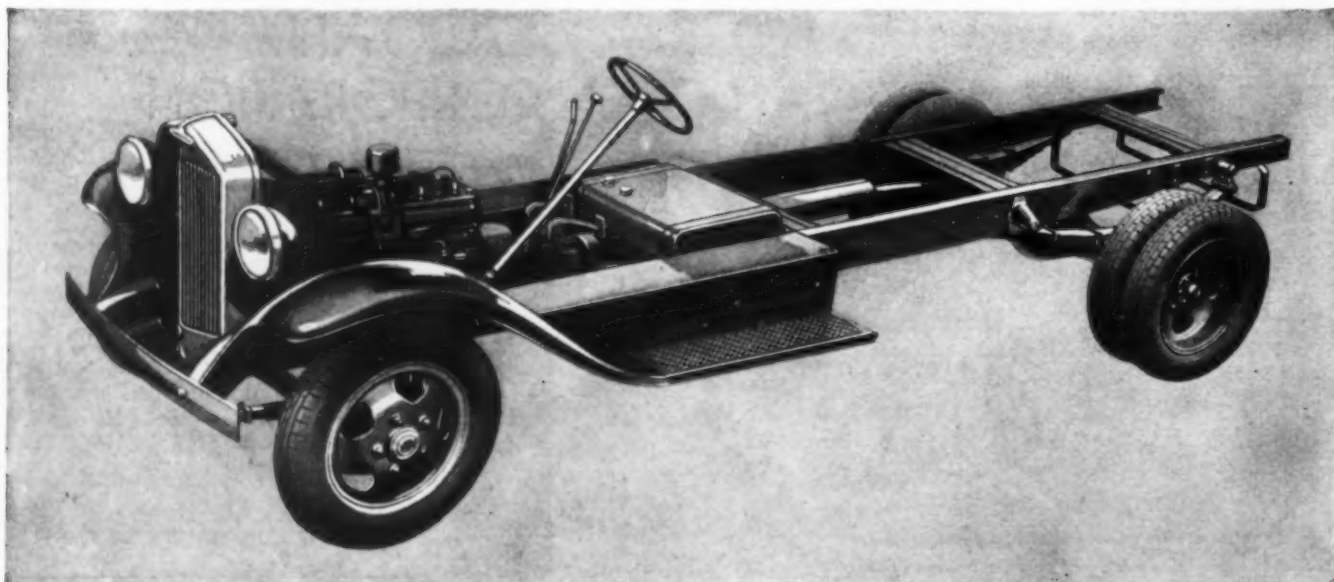
Four-Cylinder \$625, Six-Cylinder \$725
Chassis f. o. b. Lansing, Michigan
DUAL WHEELS EXTRA

Speed Wagons than words could possibly convey. Note carefully the savings in time and gas—and the *exceptional* size and strength of vital parts.

Any Reo salesman will gladly show you a portfolio which proves, by illustrated life-size comparisons of parts, the real and indisputable margin of Reo superiority.

By all means, see this SPEED WAGON before you buy!

REO MOTOR CAR COMPANY
LANSING — TORONTO



NEW Model F Self Priming Homelite portable centrifugal pump operating with a suction lift of 31 ft. 6 in. exceeding guarantee by 3 ft. 6 in.

"Some Lift!"

New Model "F" Homelite

Self-Priming - - -

No Bearings in Pump

Weights 90 Pounds

Homelite again pioneers. Three years of leadership, and now the

The biggest stride forward ever made in portable centrifugal pumps.

Without auxiliary equipment of any kind, the 28-ft. lift guaranteed is exceeded in many cases.

Capacity up to 6,000 gallons per hour. Heads up to 50 ft.

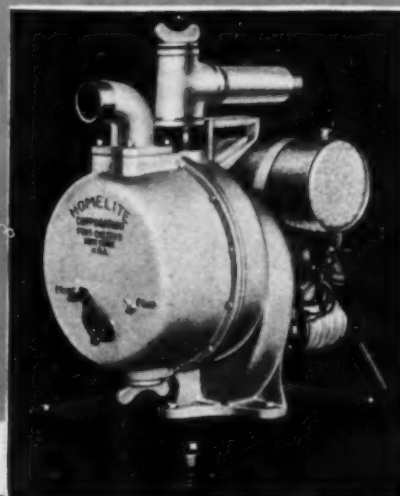
All engine bearings automatically lubricated. No stuffing box. Reliable service. Easy maintenance.

Distributors throughout the world for demonstration and service. Write for address of nearest.

HOMELITE CORPORATION
75 Riverdale Ave., Port Chester, New York

\$225

f. o. b.
Port Chester
N. Y.



Homelite units: gasoline and electric 2" and 4" self priming centrifugal pumps, blowers, air compressors, electric generating sets.



**PUMP AND ENGINE
ARE ONE UNIT**

**NO EXTRA SHAFTS,
BEARINGS OR COUPLINGS**

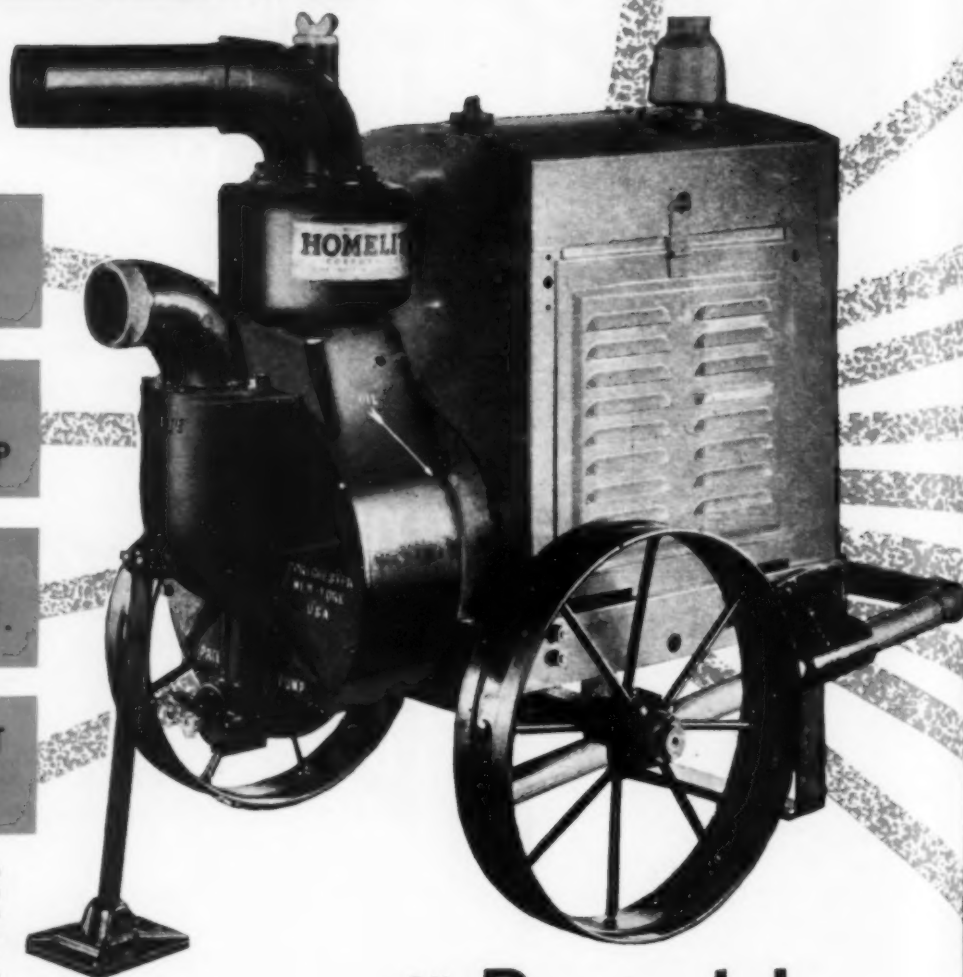
**HEADS
UP TO 50 FT.**

**NO EXTRA
PRIMING PUMP**

**WEIGHT
ONLY 730 LBS.**

**SUCTION LIFT
28 FEET**

This pump was trailed 3,600 miles connected to car as shown, covering the eastern states and as far west as Milwaukee, Wis. Easily controlled in congested traffic, and was trailed up to 60 miles per hour without damage to either pump or car.



4" Portable **HOMELITE**

2" and 4" Self-Priming
Centrifugal Pumps—
also Portable Blowers, Air
Compressors, Generators



\$580

F. O. B. Port Chester, N. Y.

**SELF-PRIMING
ONCE PRIMED—ALWAYS PRIMED**

**FOR VOLUME
UP TO
30,000 GAL. PER HR.**

**FOR SEEPAGE
ONE GAL. PER HR.**

**OPEN TYPE BRONZE IMPELLER
HANDLES MUDDY WATER WITH SOLIDS**

\$480

**F.O.B.
PORT CHESTER, N. Y.**

NO STUFFING BOX

**10-HP. 4-CYL.
LE ROI ENGINE**

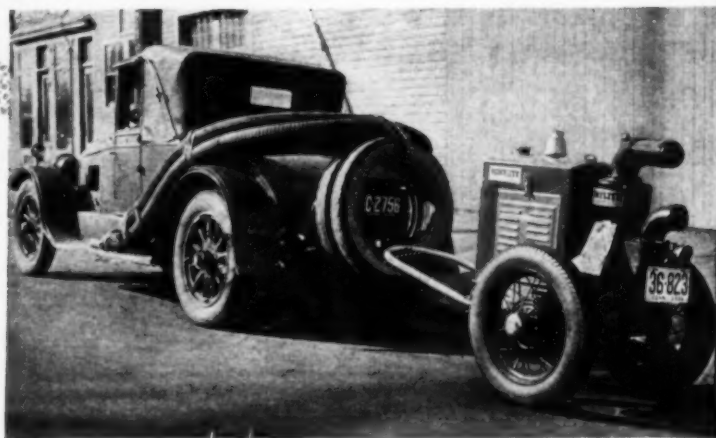
**HANDLE TELESCOPES
INTO FRAME**

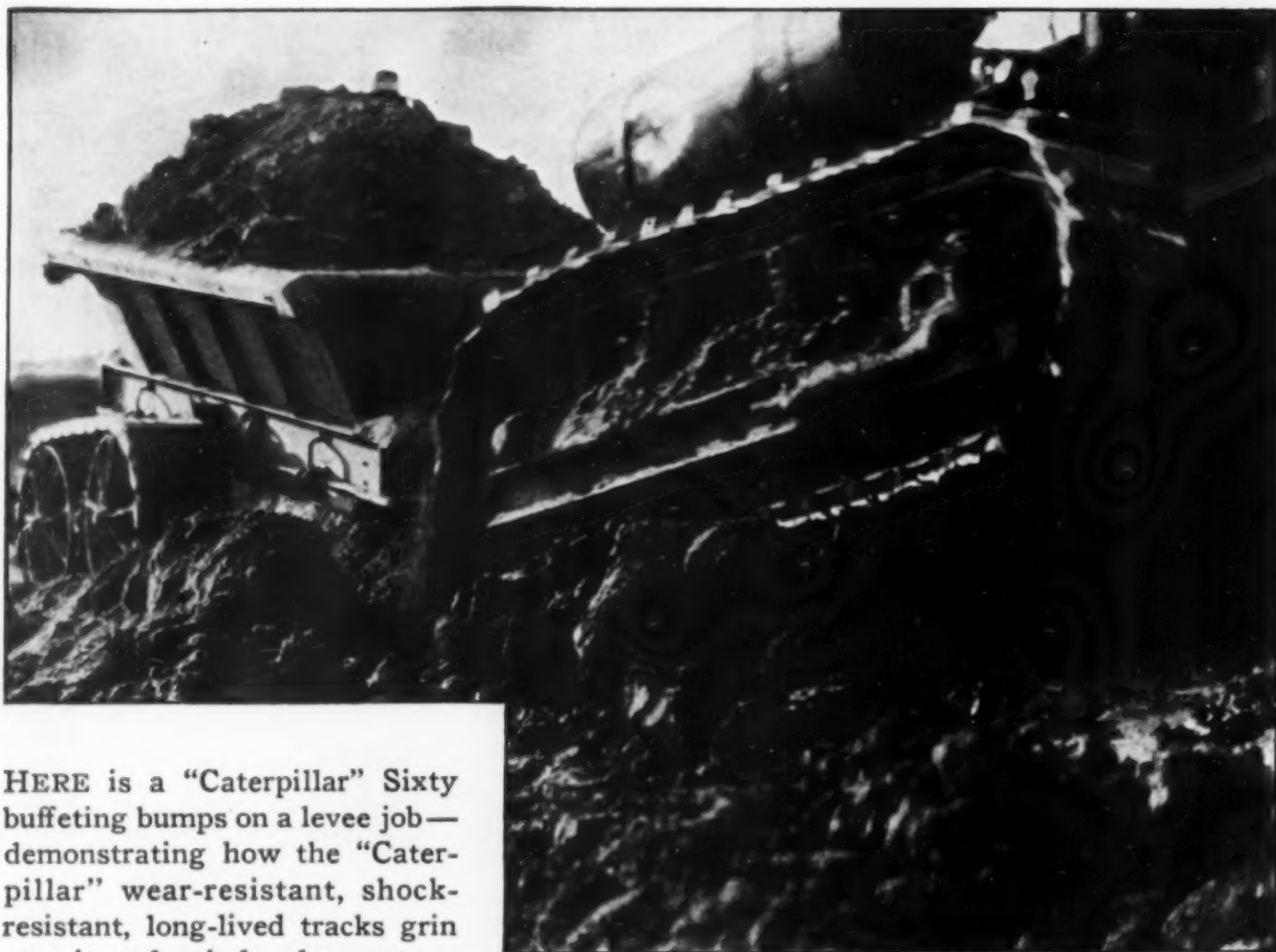
**HIGH-SPEED
TRAILER MOUNTING**

ELITE

**HOMELITE
CORPORATION**

**75 Riverdale Avenue
Port Chester, N. Y.**





HERE is a "Caterpillar" Sixty buffeting bumps on a levee job—demonstrating how the "Caterpillar" wear-resistant, shock-resistant, long-lived tracks grin at grit and grind—demonstrating how the heat-treated steels of the "Caterpillar" Tractor insure long life for wearing parts.

It is scientific, carefully controlled heat-treating of links, pins, gears and other parts that armors this tractor against shock and wear—that enables the "Caterpillar" owner to tackle his jobs with an assurance of uninterrupted service and timely completion—that guarantees to the "Caterpillar" purchaser highest returns on tractor investments—that adds to the eventual turn-in value of the "Caterpillar" track-type Tractors.

Caterpillar Tractor Co.

PEORIA, ILLINOIS, U. S. A.

Track-type Tractors

Combines

Road Machinery

(There's a "Caterpillar" Dealer Near You)

Prices—f. o. b. Peoria, Illinois

TEN	\$1100	TWENTY	\$1900
FIFTEEN	\$1450	THIRTY	\$2375
SIXTY	\$4175		

TOUGHENED TO TAKE THE JOLTS



An extra test lug is cast on final drive sprockets. "Caterpillar" metallurgists break these off and carefully examine them before accepting the sprockets.

CATERPILLAR

REG. U. S. PAT. OFF.

T R A C T O R

**MORE
DIRT
is
PAY DIRT**



OWEN BUCKETS
*are built to deliver
the goods . . . at a
profit to the owner*

Making a clamshell bucket pay means making every load count—and count big. A capacity grab every time—that's pay dirt, because it shortens the job, and lightens the labor, and lowers the cost.

That's how an Owen handles material—be it sand, gravel, crushed stone, ore, ashes, clay, coal . . . It's all pay dirt to an Owen.

A Mouthful At Every Bite—extra yardage gained per trip—hours saved—often days. Put an Owen on any kind of a job—it's not "choosy"—excavating, dredging, on the stock pile, in the barge, on the rehandling crane—and it comes through with the same record, "a bigger day's work than any other bucket of the same weight and capacity."

Because every bite tells—more dirt per trip—and that's pay dirt.

It isn't difficult to see why—Send for an illustrated folder containing the 17 Points of Owen construction. They explain.

The Owen Bucket Co., 6023 Breakwater Ave.
Cleveland, Ohio

A MOUTHFUL AT EVERY BITE



Owen Buckets

CLETRAC

CRAWLER TRACTORS

- for EVERY TYPE of
Industrial Service!

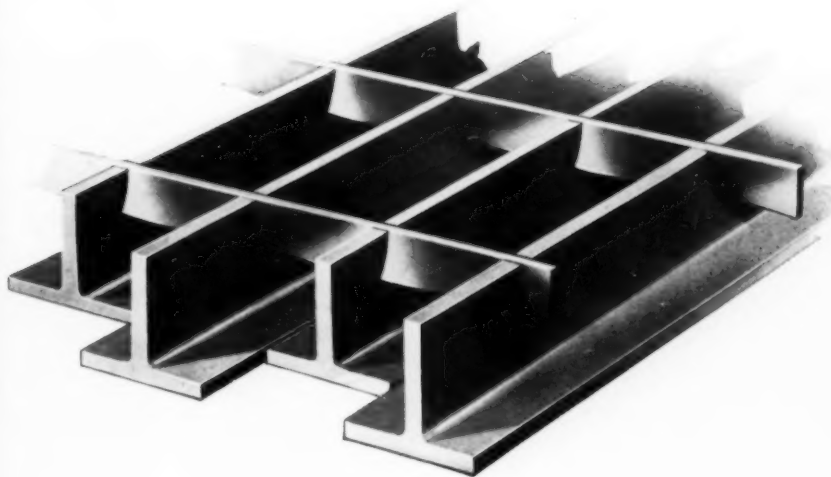
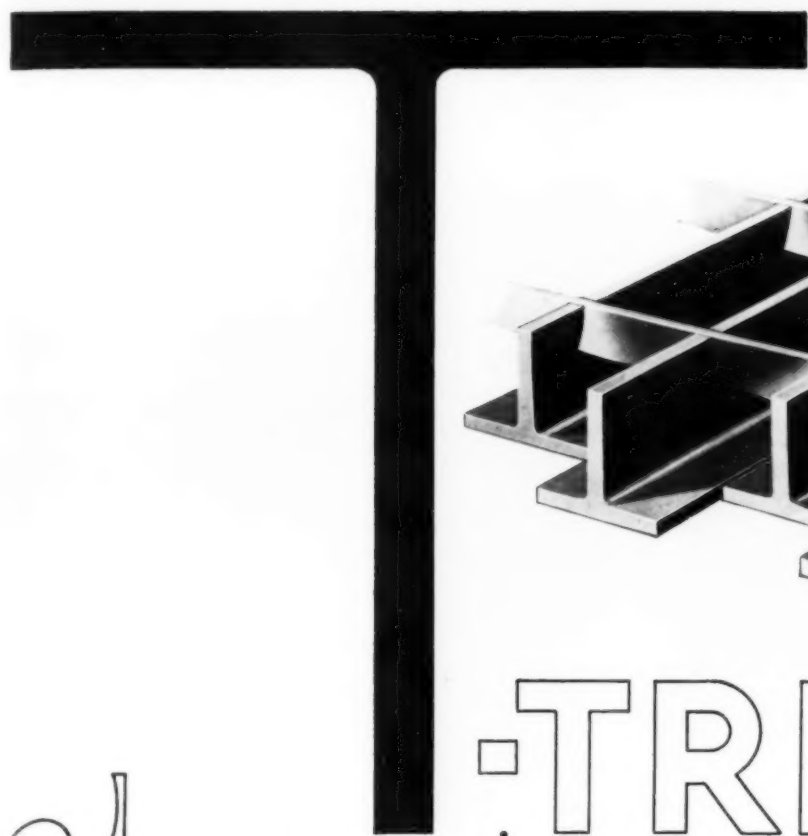
HERE are shown two Cletracs—the smallest and the largest units in the line—working on the same job for a County Highway Department.

Wherever there is earth to be moved, whether with a one-man Fresno or the heaviest of graders to carve out highways where roads have never before existed, Cletrac power and Cletrac traction can be depended upon to finish the job in shortest time at lowest cost.

Write today for special folders giving the facts about Cletrac 15 (shown above), Cletrac 80-60 (shown below), or the equally efficient "in-between" sizes Cletrac 20, Cletrac 40-30 and the Cletrac 40.

THE CLEVELAND TRACTOR COMPANY
19323 Euclid Avenue Cleveland, Ohio





T-TRI-LOK

Announcing

THE MANUFACTURE AND DISTRIBUTION BY
CARNEGIE STEEL COMPANY OF T-TRI-LOK,
FORMERLY MANUFACTURED BY THE TRI-LOK COMPANY



CARNEGIE STEEL COMPANY has acquired the rights from The Tri-Lok Company to sell, manufacture, and distribute T-TRI-LOK, a floor construction involving the use of tees in which interlocking members in the form of flat bars are forced into place under heavy pressure. This construction forms an efficient, economical member suitable for bridge and building floors, railroad crossings or similar forms of construction where self-contained floor slabs are required to support heavy loads.

T-TRI-LOK when filled with concrete is respectively stronger and lighter than any flooring system heretofore devised of equivalent weight and strength. In new construction, the use of T-TRI-LOK materially reduces the dead weight of floor system, stringers and I-Beams, and in old structures makes possible the increase in carrying capacity without increase in total dead weight of the structure.

Installation of T-TRI-LOK is simple, is manufactured and shipped in panels which can be readily anchored to stringers, and with T members in contact, no form work is required to retain concrete fill. T-TRI-LOK forms an armored concrete wearing surface of long life, and with non-skid surfaces.

Carnegie engineers are at your service, and additional data regarding details of construction will be furnished upon request.

CARNEGIE STEEL COMPANY • PITTSBURGH, PA.

Subsidiary of United States Steel Corporation

145

T-TRI-LOK

*True-color reproduction of
terrazzo floors and wain-
scot in the New York City
offices of the Universal
Atlas Cement Co. Terrazzo
made with Atlas White by
The Traitel Marble Co.,
New York City.*



Harmonious colors with Atlas White portland cement

THE possibilities of terrazzo in the modern office building are almost unlimited. Terrazzo is adaptable both as to color and design; a wide choice of patterns and color combinations is always available. Terrazzo is permanently beautiful. It is both easy and inexpensive to maintain. It is durable.

Pure and distinctive colors in terrazzo are best obtained with a white base. Against a pure white or lightly tinted background all the natural beauty of colored marble chips is preserved and displayed. For these reasons Atlas White portland cement is used both in this country and abroad for fine terrazzo work.

Name _____
Address _____
UNIVERSAL ATLAS CEMENT CO.
208 S. La Salle St., Chicago
Without obligation, please send
me further information on
Atlas White terrazzo.
C. M. 7-21

CONCRETE FOR PERMANENCE

Universal Atlas Cement Co.

Subsidiary of United States Steel Corporation



CHICAGO • NEW YORK • PITTSBURGH • MINNEAPOLIS • KANSAS CITY

© U. A. C. Co.

Construction Methods

A MCGRAW-HILL PUBLICATION—ESTABLISHED 1919

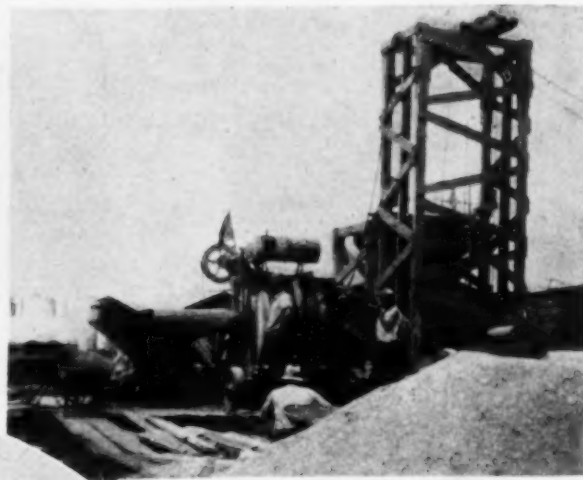
ROBERT K. TOMLIN, Editor

VOLUME 13

NEW YORK, JULY, 1931

NUMBER 7

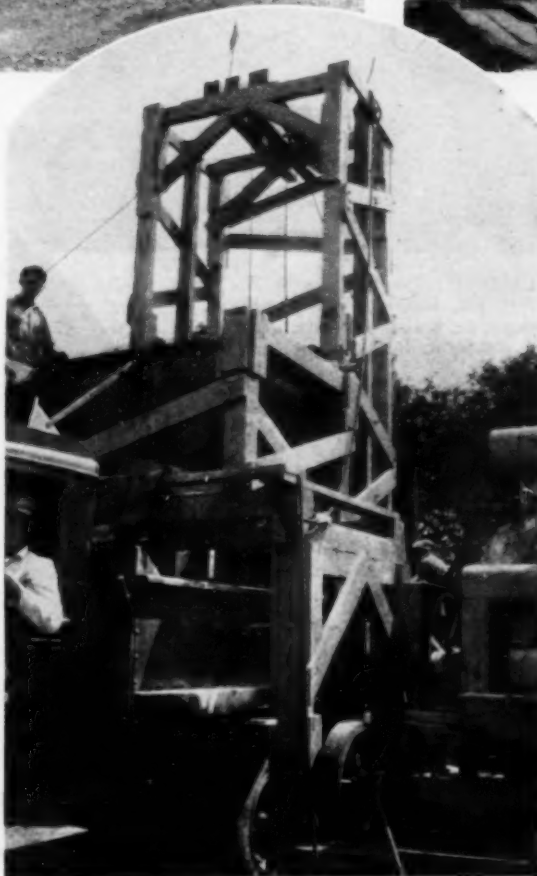
Central Mixing Plant for Pavement Repair Designed for Portability



IN REPAIRING concrete pavement on the two-lane roads in the vicinity of Chicago and East St. Louis, Ill., interference with traffic, caused by the mixers and material on the road, and to the repair crew, caused by the passage of vehicles, grew to such an extent that a police officer was required at points where the work was under way. In order to increase the efficiency of the maintenance work and to lessen the interference to traffic, a portable central mixing plant, built up around a two-bag-batch concrete mixer, was developed.

The plant consists of a wooden tower with dump bucket and gasoline hoist and a steel batch-box for the mixed concrete set high enough for a dump-body truck to be backed under it. The tower and batch box platform are made of 6x6-in. timbers securely fastened by 2x6-in. braces bolted on. The construction is so designed that the plant can be dismantled, moved on three 3-ton trucks and erected in a day's time.

The maximum haul of mixed concrete was 12 miles, the average haul



By FRANK T. SHEETS
Chief Highway Engineer,
Department of Public Works, Illinois

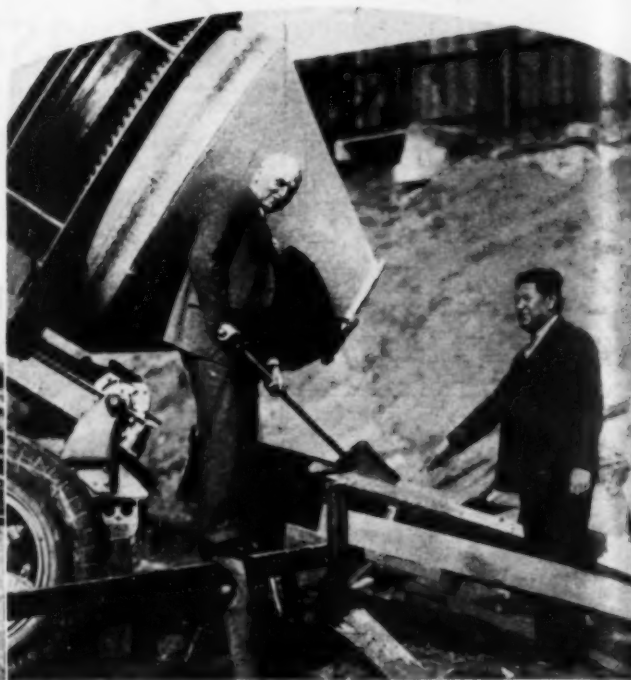
3 to 5 miles. The working crew consisted of 5 men at the mixer, 15 men tearing out and hauling away old concrete and preparing subgrade, 2 men finishing the patches on the road and 1 man hauling material at the plant. Two 3-ton dump-body trucks were used for hauling the mixed concrete from the plant to the repair patches on the road. Three trucks were used for cleaning up and hauling away the old concrete and a 120-cu.ft. air compressor and 100-lb. pneumatic pavement breaker were used for tearing out old pavement. An average of about 150 sq.yd. per day was put in and the average time from the mixing of the concrete until it was placed on the subgrade was 20 min.

The use of the plant was made economical by reason of the amount of repair work which could be done within reasonable distance of the set up. Its use on incidental or widely separated small jobs would not be economical. The aggregates were proportioned by weight according to the Illinois mortar void method of mixing concrete.

This Month's "News Reel"



POURING OF THE CONCRETE ARCHES for the \$4,000,000 Westinghouse Memorial Bridge at East Pittsburgh, Pa., is under way by Booth & Flinn Co., contractor. Structure, 1,524 ft. long, consists of five arches, the largest having a record-breaking span of 460 ft. between pier centers.



FIRST CONCRETE enters foundation for San Francisco's War Memorial, provided for by \$4,000,000 bond issue. Mayor Rossi (*left*) and Louis J. Cohn, contractor, guide discharge of truck mixer.



DETROIT GETS ROAD SHOW. Charles M. Upham (*right*) informs Governor Wilber M. Brucker of Michigan (*left*) and Fred Wardell, Detroit committee chairman (*center*), of American Road Builders' choice of convention city for 1932.



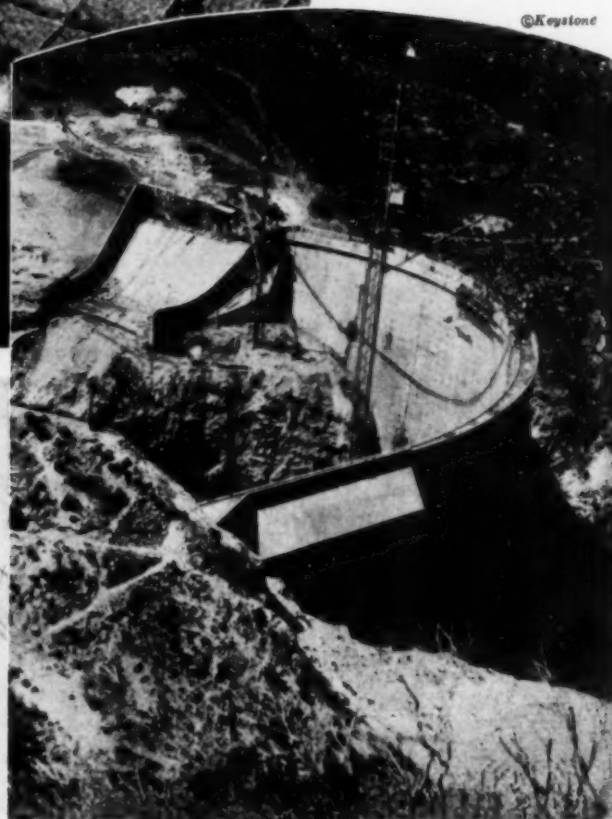
NEW SUBWAY under Eighth Avenue carries first train on newly installed tracks under New York City's streets.



NIGHT WORK helps to speed progress on Pacific Gas & Electric Co.'s Salt Springs dam on Mokelumne River, Calif. Rock-fill structure 330 ft. high, largest of its type in the world, contains 3,000,000 cu.yd. of granite.

BIG TUJUNGA DAM (below), newest unit in Los Angeles County's flood-control project, nears completion in California. Arch type structure, 200 ft. high above streambed, contains 90,000 cu.yd. of concrete, placed by Edwards, Wildey & Dixon Co., contractor.

©Keystone



©Keystone

CONCRETE ROADWAY is being placed on suspension bridge across the Hudson River between Ft. Lee, N. J., and New York. Two 28-ft. lanes will carry traffic. Corbetta Concrete Corp., of New York, is the contractor for the paving. Concrete, delivered by industrial railway on bulb beams of bridge floor system and placed on collapsible steel-pan forms, is vibrated with special hammers.

WITHOUT disturbing in the slightest degree the regular business of telephone exchanges and offices, the John Eichleay, Jr. Co. of Pittsburgh, under sub-contract with Leslie Colvin, last fall lifted, moved laterally, rotated, and set on new foundations the 11,000-ton, steel-frame Indianapolis headquarters building of the Indiana Bell Telephone Co. Essentially, the scheme of operations consisted in: (1) paving the area involved with a level concrete mat covered by a timber cushion carrying steel rails, (2) riveting brackets to the building columns and jacking up the structure by means of powerful screw jacks (needle beams being placed under the brackets), and (3) transferring the column loads to rollers and moving the building in the desired direction with the screw jacks, aided, during rotation, by block and tackle connected to a hoist engine.

Plans for Moving Building—As indicated by the aerial photograph, the telephone company owned two buildings occupying diagonally opposite corners of a valuable lot in the downtown section of Indianapolis. The headquarters building, which occupied the more desirable location, in the northeast corner, fronted 101 ft. 3 in. on Meridian St. and 134 ft. 4 in. on New York Ave. In the southwest corner of the plot, the Lincoln-Riley building had a frontage of 50 ft. on Pierson St. and 96 ft. on Miami St.



FIRST MOVEMENT of telephone building is in straight line, parallel with rails under rollers, from right to left. Workmen are removing last truss of connecting bridge between headquarters building and Lincoln-Riley building preparatory to starting movement. Note radial white lines on rails, converging at pivot point.

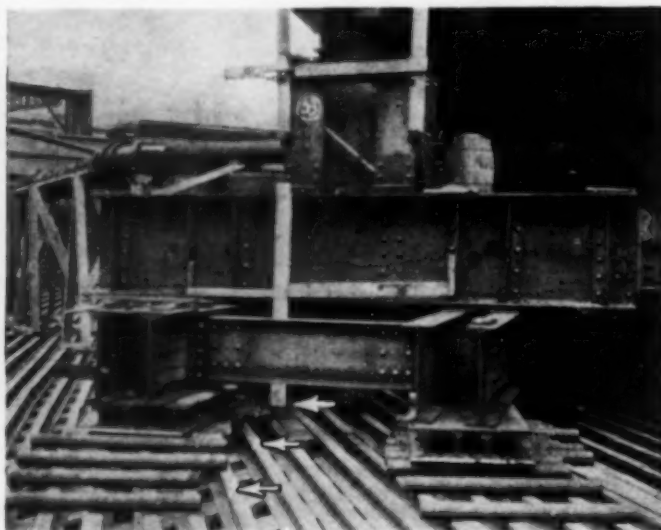
11,000-TON TELEPHONE *Without Disturbing*

The telephone company, faced with the necessity of enlarging its facilities, acquired the rest of the property in the block.

To make way for a new building on the Meridian St. frontage, it was desired to transpose the building from the northeast corner of the block to



BLOCK AND TACKLE connected to steam hoisting engine provide part of force needed for circular movement. Rails are laid to parallel direction of movement as closely as possible. Angle between rails and rollers is never allowed to be less than 45 deg.



VERTICAL STICK (left), attached to needle beams at corner of building, is pointer which must follow white arc painted on steel rails. Note temporary service pipe connection. All service lines are maintained in continuous operation during moving.



BUILDING ROTATES THROUGH 90 DEG. about pivot point near original southwest corner of structure. Curved bridge affords access to movable entrance bridge during this part of operation. During moving of building, telephone, light, water and sewer lines are maintained in service.

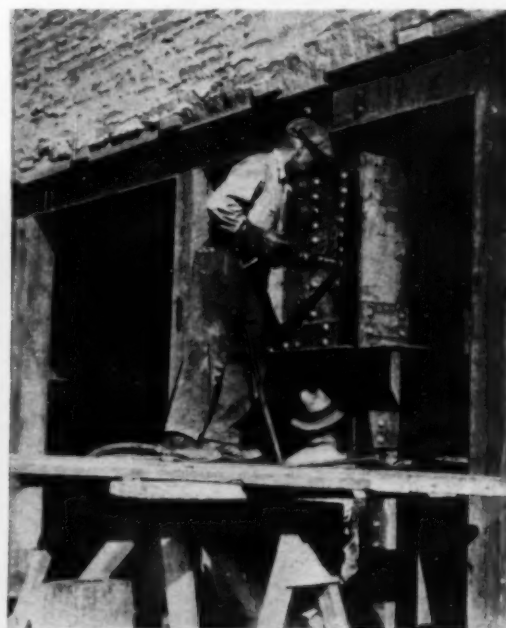
BUILDING TRANSPOSED

Normal Business

the northwest corner and to rotate it through a 90-deg. angle, thus turning the New York Ave. façade to face on Pierson St. Trials with cardboard

models indicated that the most economical path to take in moving the building would be a straight move south for 52 ft. and a second rotary

RADIAL LINES (right), painted on steel rails and intersecting at pivot point, indicate correct position of rollers. By sighting along these lines, workmen can correct any error in direction of rollers.



I-BEAM BRACKETS are riveted to columns. Bottoms of I-beams are milled to bear on needle beams.

motion about a pivot point near the southwest corner of the structure. This plan required the building to be lifted only once to change the alignment of the shoes and rollers from a straight to a circular path.

Preparation for Moving—Leslie Colvin laid a 6-in. concrete mat over the area to be traversed by the building during the moving operations. Great care was exercised in finishing this mat to bring the top to an accurate level. Over the concrete mat, the moving contractor laid a cushion of 6x8-in. Douglas fir timbers, laid flat on 16-in. centers, with the ends of the timbers overlapping. On the timbers was placed a system of 85-lb. tee-rails, spaced on 9-in. centers. The rails were laid to parallel as closely as possible the direction of motion of the rollers and in no case formed an angle of less than 45 deg. with the rollers.

Structural Design—At the request of the John Eichleay, Jr. Co., the steelwork to support and stiffen the building was designed on the basis of using four rolling surfaces at each column. To each column was riveted a pair of I-beam brackets. The I-beam brackets were installed in vertical position, and their bottoms were milled to bear on a pair of needle beams, with the flanges of the I-beam brackets bearing directly above the webs of the needle beams. Under the needle beams supporting the columns of each east-and-west row were two pairs of continuous beams which transferred the load, through groups of four 80-lb. rails, to the 3-in. steel rollers. The rollers rested directly on the 85-lb. rails laid on the 6-in. timbers.

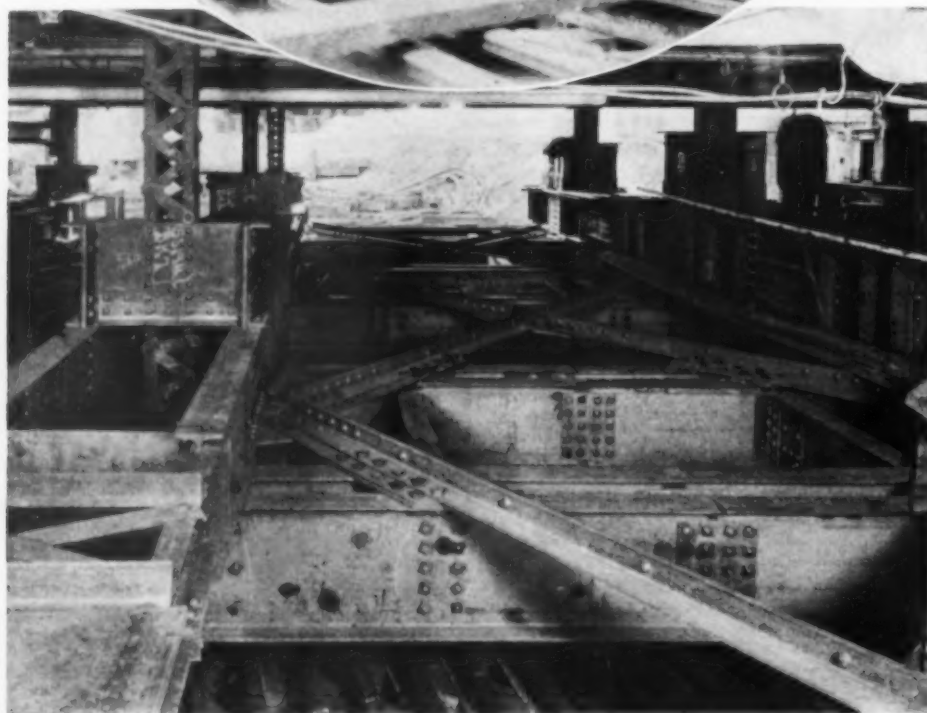
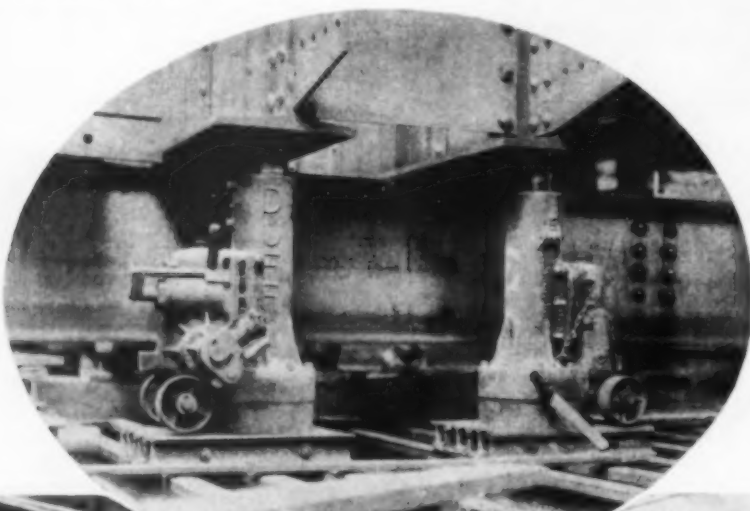
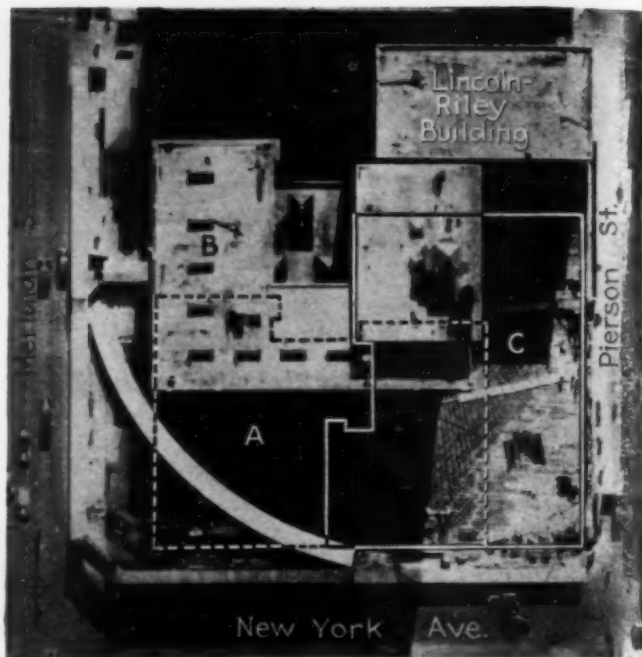
To accommodate the jacks used in

lifting and lowering a column, the needle beams extended several feet beyond the continuous I-beam girders. To stiffen the steel work in a north and south direction, pairs of 12-in. channels were placed between the ends of needle beams under adjacent columns. Diagonal bracing in each panel equalized lateral strains and prevented distortion.

Transferring Load to Rollers—It was necessary to raise a column only $\frac{1}{8}$ to $\frac{1}{4}$ in. in order to transfer the load from the base to the rollers. Four Duff ratchet screw jacks of 100-ton capacity lifted each column. As it was impractical, because of the number of jacks and men required, to raise all the columns at once, the contractor jacked up from four to six at each operation, with satisfactory results.

Lateral Movement—Although the moving force used in designing the steelwork had been estimated at from 300 to 400 tons, the actual moving

THREE POSITIONS OF BUILDING (right). A (indicated by broken lines), original position; B, second position, at end of lateral movement; and C (marked by solid lines), final position, after completion of circular movement.



STRUCTURAL FRAMING braces columns in all directions during movement. Temporary steelwork amounts to 600 tons. RATCHET SCREW JACKS (in oval), under needle beams, lift column to permit placing of shoes and rollers.

force proved to be much less, amounting to only $1\frac{1}{2}$ to 2 per cent of the vertical load. The first move, in a straight line south, was completed in four days.

Eighteen Duff 100-ton ratchet screw jacks distributed along the north face of the building supplied the moving force. Each jack exerted a pressure of 10 to 12 tons. The jacks were placed against blocking on the sides of the supporting steelwork and were braced back against the sidewalk vaults and steel sheet piling.

To keep a uniform movement and pressure at all jacking points, the jack operators were instructed to take an equal number of strokes on the lever after each whistle signal blown by the foreman. The jacks had a run-out of 12 in. As soon as they had been extended to their limit, they were reset for the next shove. A gang of men watched the rollers and reset them as the building advanced.

Circular Movement—Before beginning the circular movement, the columns had to be lifted and the rollers and shoes readjusted to travel on an arc. The contractor located the pivot point on the steel rails and on the basement ceiling, described a circle about the pivot point, and suspended a couple of plumb-bobs from the ceiling to travel on the circle as the building rotated.

In addition to the markings at the pivot point, white lines were painted on the steel rails to describe the path of the corners of the building. Pointers attached to the building at the corners followed these arcs when the movement was taking its true course. When any deviation was indicated, workmen brought the building back to the desired course by "cutting" the

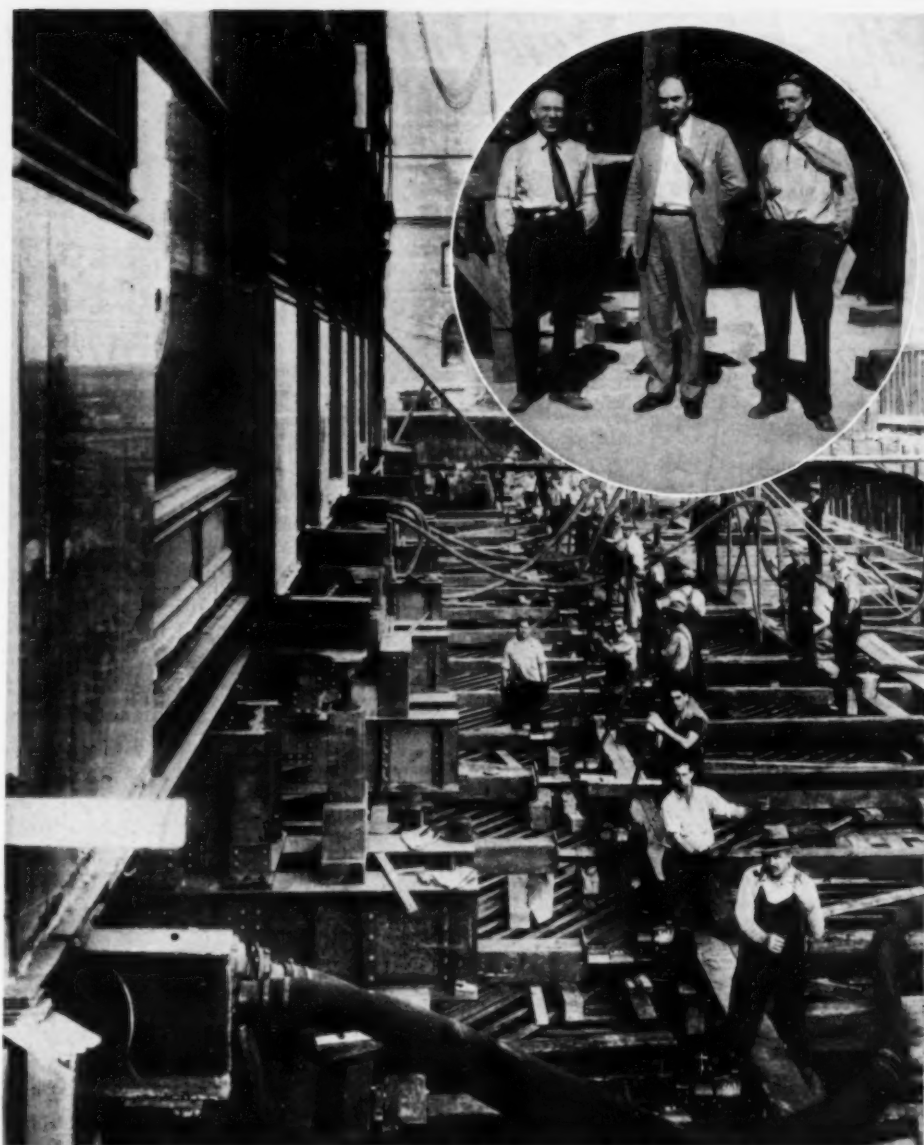
supporting rollers with sledge hammers.

It was necessary to place the rollers radially to make the circular move. E. Dauenhauer, moving engineer for the John Eichleay, Jr. Co. evolved the method of painting radial white lines on the steel rails to gage the correct direction of the rollers. In combination with the arcs painted along the path followed by the corners of the building, the radial lines enabled the contractor to move the structure without deviating at any time more than 1 or 2 in. from the true course. For the last 20 ft. the maximum variation was only about $\frac{1}{4}$ in. When brought to its final position, the building was only $\frac{1}{8}$ in. from designed location.

The length of the longest arc described by the building in the circular movement was 224 ft. A large part of the force required in the moving operation was supplied by a steam hoist engine from which two sets of 6-sheave block and tackle were connected to the building. The hoist engine exerted a total force of probably 60 tons through the two sets of block and tackle. Ratchet screw jacks distributed along the east side of the rear wall supplied the rest of the force necessary for moving. The number of lever strokes taken by the operators of these jacks was varied in accordance with the distance from the pivot point.

After 5 days spent in making the adjustments and other preparations for the circular movement, the move itself was accomplished in 17 days.

Setting Building on New Foundations—The operation of landing the building on its new foundations was just the reverse of placing it on rollers. Five or six columns were jacked up at a time to a height sufficient to allow



EIGHTEEN JACK OPERATORS distributed along north face of building, work jacks in unison at signal from foreman. (In circle) **LESLIE COLVIN** (center), general contractor; **Ed Brown** (left) in charge of iron workers for John Eichleay, Jr. Co.; and **Fred A. Dauenhauer** (right), foreman, John Eichleay, Jr. Co.



RATCHET SCREW JACKS provide force for moving building. At signal given by foreman, who blows whistle, each jack operator takes assigned number of strokes on lever arm.

replacement of the cast-iron pedestals, and grout made with quick-setting cement was forced between each base and the top of its foundation. The work was done progressively to avoid unnecessary strains in the structure.

Maintenance of Building Services—During the moving of the building, telephone exchanges and offices continued to operate as usual. To maintain telephone service, seven 200-ft. lengths of armored submarine cable were spliced into the lines where they left the building. These cables were pulled along with the building. Gas, water, sewer, and steam-heat lines were maintained in service by installing hose connections in multiple, with by-pass valves which allowed lengthening or shortening of the hose without closing the line. Aerial connections of sufficient length provided for uninterrupted electric-power service. Elevators continued to operate, stopping at the first floor.

Occupants of the building could not feel the slow, steady motion, nor was the movement perceptible to casual observers.

Engineering—Those responsible for the development of the moving plan were F. A. Montrose, vice-president and general manager, Vance Oathout, chief engineer, and E. B. Webb, building and equipment engineer, Indiana Bell Telephone Co.; Vonnegut, Bohn & Mueller, architects, Indianapolis; and F. F. Voorhees, of Voorhees, Gmelin & Walker, New York, consulting architects for the American Telephone & Telegraph Co. Moran & Proctor and H. G. Balcom, consulting engineers, New York, investigated the feasibility of the plan and designed the foundations and structural features.

As mentioned before, Leslie Colvin, Indianapolis, was general contractor, and the John Eichleay, Jr. Co., Pittsburgh, was moving subcontractor, with E. Dauenhauer as engineer in charge.

Pipe-Line Men Improve Methods of Constructing Large Gas Transmission Mains

Part II

Bending and Laying Pipe

CONSTRUCTION of pipe lines up to 24 in. in diameter for transportation of gas from producing fields to markets hundreds of miles distant has served to emphasize the need for more economical field methods. As mentioned in last month's article, the operations of bending pipe and applying protective coating are two

examples of steps in the process of construction which consume an undue proportion of time. The first article of this series described the method of applying one kind of protective coating and making one type of welded joint. This month's article illustrates methods of bending large-diameter pipe, of ditching, of installing pipe couplings, of laying mains and of back-filling. The operations described in these articles were performed by two successful pipe-line contractors, Smith Bros., Inc., of Dallas, Texas, and Williams Bros., Inc., of Tulsa, Okla.

Machine Ditching—In soil free from rocks and boulders wheel-type ditching machines are the fastest, although recent developments in the ladder-type trenchers have made them capable of

nearly equal speed. The ladder-type machine has the decided advantage that it can continue to operate at a slower rate through rocky ground which would stop a wheel-type excavator. Under ideal conditions, a wheel-type trenching machine can cut a ditch 5 ft. deep and 36 in. wide at the rate of 600 ft. an hour. The maximum rate for



LADDER - TYPE TRENCHER of Williams Bros., Inc., excavates 5-ft. trench 32 in. wide in clay and sandy clay at rate of 360 ft. an hour, operating in third speed. In fourth speed, Parsons machine cuts 480 ft. an hour. These speeds are for good digging conditions, no allowance being made for slipping caused by rock.



WHEEL - TYPE DITCHER of Smith Bros., Inc., cuts trench 6 ft. deep by 36 in. wide through clay and sandy clay on uphill grade at about 200 ft. an hour. Each of three Buckeye wheel-type excavators on this section averages 3,500 ft. of 5-ft. ditch 36 in. wide in 12 hours. Maximum possible rate for one machine is 600 ft. per hour.



TRENCH IN ROCK (right) requires large hand gang, air compressors, pneumatic tools, and dynamite. Trench hoes excavate broken rock for Williams Bros., Inc., on parts of line, saving much hand labor.

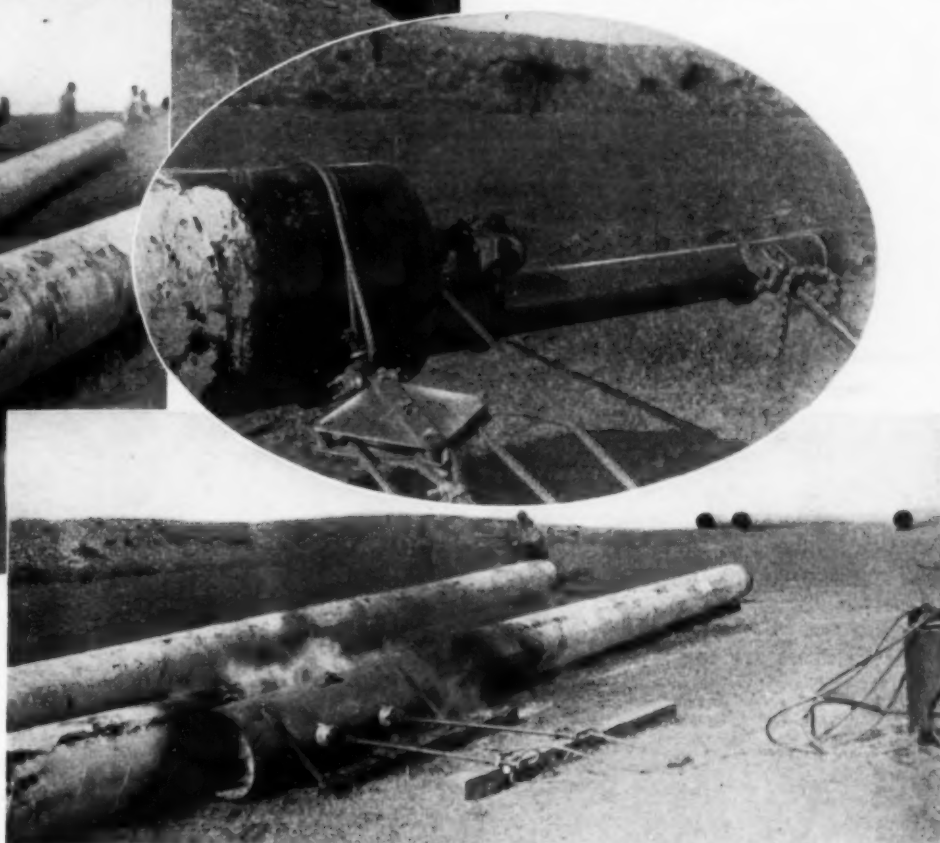
BENDS IN PIPE (right) to conform with changes in grade and alignment of trench must be made in field just ahead of laying gang. Smith Bros., Inc., details one crane to line up pipe along ditch ahead of laying gang.

TO BEND PIPE (below) spreader block is placed between two pipe sections, and pipes are lashed together at one end.



this size ditch with a ladder-type machine is generally less than 500 ft. an hour.

Hand-Ditching—In rock, the pipeline contractor is forced to resort to using large gangs of hand labor, with pneumatic tools and explosives to break the rock for removal. Portable gasoline-powered compressors supply the air to operate drills and paving



TWO OIL BURNERS heat portion of pipe for bending. Fuel tank is filled with either kerosene or distillate, and portable compressor supplies excess air to burners. Shield directs heat against pipe.



AFTER HEATING PIPE, gang bends it by means of block and tackle connecting divergent ends of two pipe sections. Workmen wind fall line of block and tackle on small pipe inserted in end of large pipe. One chain pipe wrench keeps this improvised winch from slipping while men on handle of second wrench wind up fall line, thus bending heated pipe toward them.

breakers. It is the usual practice to drill, load and shoot a long line of ditch in one operation.

Bending Pipe—Field methods of bending pipe, although effective for all diameters, require too great an expenditure of time and labor when applied to 24-in. and slightly smaller sizes of pipe. As illustrated by the photographs, the process consists of (1) heating the pipe at the point where it is to be bent and (2) drawing one end of the pipe the desired distance from the tan-

IMPROVED WINCH (below) for bending pipe. Two pipe wrenches and one end of block and tackle can be seen.



TO HANDLE PIPE (left) while installing couplings, Smith Bros., Inc., uses Northwest crane with shortened boom. Pipe section 80 ft. long weighs about 7,200 lb.

laying gang when building through rolling, plains country.

Pipe Couplings—Dresser couplings are specified to provide for expansion in the 24-in. mains of both the Continental Construction Company and the Missouri-Kansas Pipe Line Company, on which the two contractors were en-

DRESSER COUPLING (below) provides for expansion in pipe. Sleeve (on ground) fits over ends of two pipe sections. Circumferential bead on inside of sleeve keeps it centered on joint. Rubber gaskets and steel collars (on pipes) bear tightly against sleeve, preventing leakage.



gent by means of a block and tackle arrangement. From 20 to 30 minutes is needed to make a bend in a 24-in. pipe by this method, and a similar length of time must be spent in moving and setting up the apparatus for the next bending operation. The slow progress of the pipe-bending work makes it necessary for a contractor to keep two bending gangs ahead of the



PARTS of Dresser coupling (left): sleeve, rubber gaskets, collars, and bolts which draw collars tightly against sleeve.



WHILE CRANE HANDLES ONE PIPE SECTION, workmen slip end of pipe into sleeve of coupling.

COLLARS AND GASKETS (below) are pulled up against sleeve by tightening bolts. With coupling completed, pipe is ready for laying.



BOOM AND WINCH attachments (right) on two Caterpillar 30-hp. tractors support pipe behind coupling crew during laying operations. Miss Evelyn Foreman, daughter of Charles S. Foreman, general superintendent for Smith Bros., Inc., helps her father to supervise operations.



STEEL HORSES EQUIPPED WITH B. B. HAND HOISTS (left) lower pipe behind tractor outfits. Substitution of this equipment for old method of lowering by snubbing rope around cross member of welded tubular horse reduced cost of operation 50 per cent for Smith Bros., Inc. Tractors with side booms move horses.

gaged. The photographs show the simple, sturdy construction of the Dresser coupling. Because of its simplicity, the coupling is installed easily and rapidly in the field.

Laying and Backfilling—Boom attachments mounted on tractors and

TO COMPACT BACKFILL at highway crossing, Cleveland mechanical tamper hammers down each layer of earth as it is shoveled into trench by hand.



AFTER LAYING PIPE (left), contractor backfills trench with two Buckeye dragline machines.



steel horses equipped with hand hoists lower the main into the ditch after the pipe sections have been coupled together. Backfilling machines of the dragline type cover the pipe. Mechanical tampers often are employed to compact the fill at highway crossings and other places where a solid backfill is necessary.

[[NEXT MONTH]]
A multiple-main river crossing.



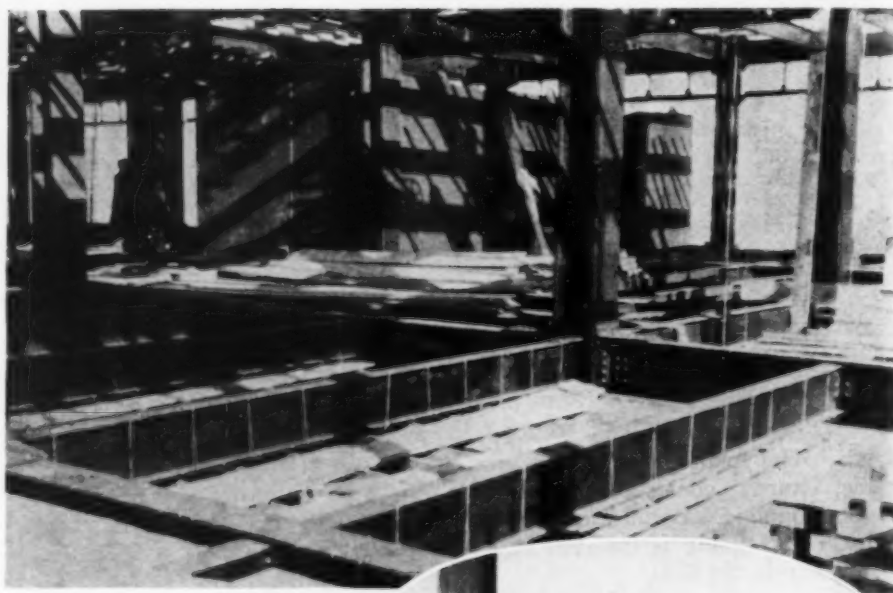
COLOR

BUILT INTO SKYSCRAPER

Part II—*Horizontal Bands of Blue-Green Glazed Terra-Cotta Blocks Form Exterior Spandrel Facing on New 33-Story McGraw-Hill Building*

FOLLOWING closely behind the steel erectors, whose operations in building the structural frame of the new 33-story McGraw-Hill building at 330 West 42nd St., New York, were described in *Construction Methods* last month, came the crew which mixed and placed concrete for the floor slabs and around the girders and columns. The work was done by the Knickerbocker Fireproofing Co. under a subcontract with Starrett Bros. & Eken, Inc., general building contractors.

Concrete Floor Slabs—For the major portion of the steel frame, including the main tower starting at the sixteenth floor, the column spacing produces bays 18 ft. 2 in. x 21 ft. 10 in. For the floor system the girders are, for the most part (except on lower floors carrying heavy loadings) 22-in. I-beams supporting 14-in. I-beam floor joists, 7 ft. 3 in. on centers. The wood

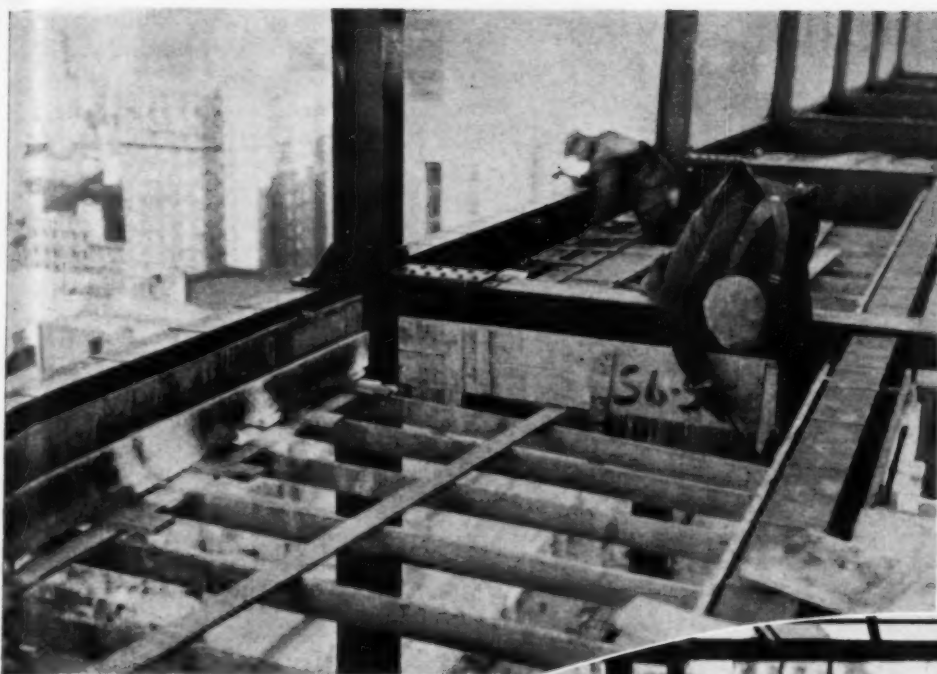


WIRE HANGERS (above) from I-beams support forms for concrete floor slabs, eliminating shoring on floor below.

DIAGONAL JOISTS (below) are placed to carry form decking.



WOOD FORMS are built up around steel I-beams of floor system to provide at least 2 in. of fireproof concrete covering.



hangers from the steel joists and girders, leaving the floor below unobstructed by shoring. Across supporting timbers hung underneath the lower flanges of the steel I-beams timber joists were set on edge, diagonally, as shown in the illustration, on page 40, to carry the decks of the forms. This type of form work involves minimum nailing and is readily stripped after the concrete has set.

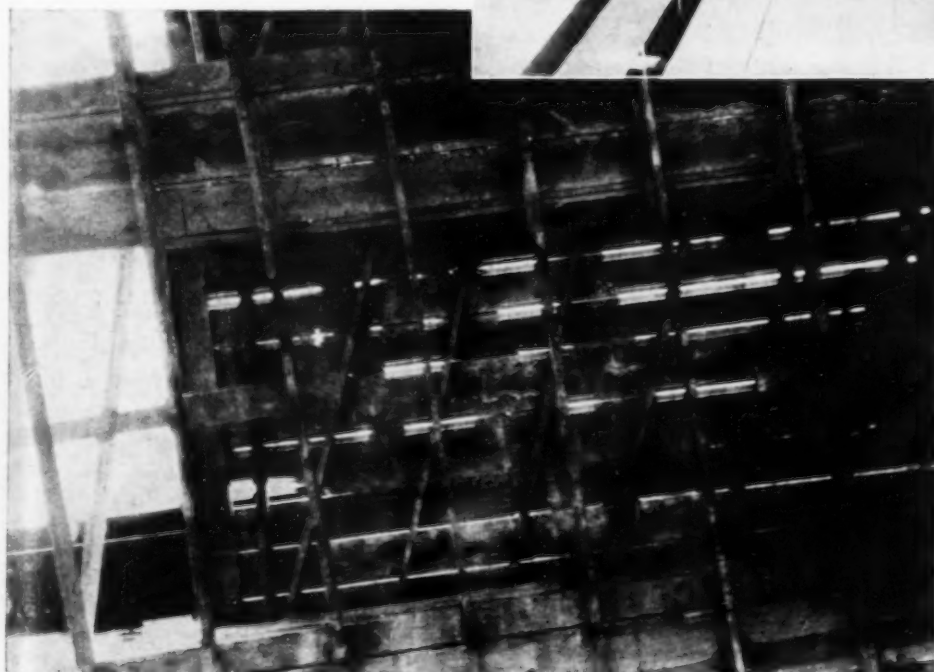
During the early stages of the floor work the subcontractor employed forms sufficient for four floors of the building. Later, forms for one more floor were added, making five sets in all. Forms were stripped usually three or four days after the slabs had been poured. The progress schedule called for the completion of floor slabs

STARTING FORM WORK (*above*) and completing the decking (*right*) to carry the concrete for the floor slabs.

forms for concreting the floor slabs, therefore, were set up in panels generally 18 ft. 2 in. x 7 ft. 3 in.

Depending upon the floor loadings, two thicknesses of 1:2:5 cinder concrete floor slab were specified: 8 in. for the second to eighth floors, inclusive, carrying heavy mechanical plant, and 4 in. for the remaining floors, designed for office use. All floor slabs are covered by a 3-in. cinder fill and a 1-in. finished top surface.

Floor Forms—Wood forms for the concrete floors were suspended by wire



FROM UNDERNEATH, showing how joists wired to I-beams carry diagonals supporting form decking.

for four stories of the building every week.

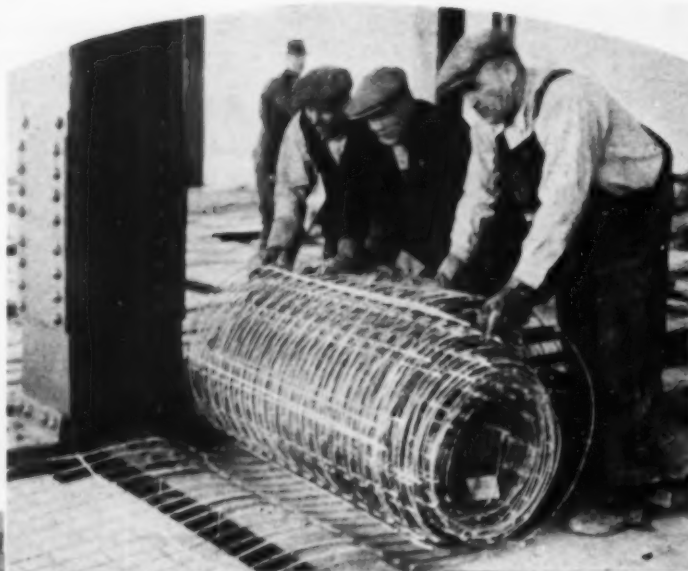
Concrete for floor slabs up to the sixteenth story was produced by two 1-yd. mixers in the basement, one being served by a 1-yd. bucket hoist extending to the top of the building, and the other by a three-wheelbarrow platform hoist carried up only to the sixteenth floor, where the floor area of the structure is reduced by setbacks to form the main tower. Above the sixteenth story all floor slab concrete was delivered by the 1-yd. bucket hoist.

Concrete was delivered to the slab forms in wheelbarrows over plank runways. Reinforcement consisted of welded wire mesh which was unrolled into place. All columns were encased in concrete poured into wooden forms held in place by clamps, and the bottom flanges and webs of steel floor joists and girders, to which soffit clips were

attached, also were fire-proofed by a minimum thickness of 2 in. of concrete.

The building is wired for all the motors necessary to operate the mechanical equipment of the McGraw-Hill Co. In the office floors underfloor ducts provide raceways for high and low tension wires to desks at any location on the floor.

Colored Terra Cotta Spandrel Facing—The dominant architectural feature of the McGraw-Hill building is the



leg of each clip a pair of 2x $\frac{1}{2}$ -in. slots carrying $\frac{1}{2}$ -in. bolts permit of adjustment to insure accurate alignment of the shelf angles.

The bands of blue-green glazed terra cotta around the exterior of the building, manufactured especially for this job at the South Amboy (N.J.) plant of the Federal Seaboard Terra Cotta Corp., of New York, vary slightly in width; most of them are 4 ft. 3 $\frac{1}{2}$ in., with a maximum width of 4 ft. 10 $\frac{1}{2}$ in. Each

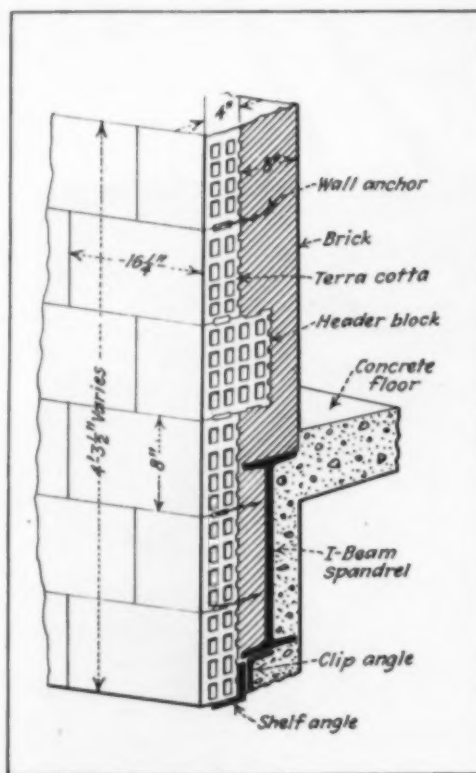


CONCRETING THE FLOOR SLABS with batches delivered by wheelbarrow from bucket hoist. STEEL REINFORCEMENT (above) of welded wire mesh is unrolled into place.

blue-green color of the four facades created by the use of glazed hollow terra cotta blocks as facing for the spandrels and the vertical piers on the east elevation. To provide a maximum of daylight on all floors, Raymond Hood, Godley & Foulhoux, the architects, designed a building in which windows occupy 55 per cent of the wall area on the lower floors (where story heights are greatest) and 48 per cent on the upper floors. The percentage of window area to net floor area varies from 21.5 per cent for the lower floors to 53.5 per cent for the tower or office floors (above the sixteenth story).

The building exterior is in effect, a succession of horizontal stripes, the glass areas alternating with the bands of blue-green terra cotta.

To provide support for the exterior terra-cotta blocks below the level of each floor and also to form a connection with the top of the metal window frame, 3x2 $\frac{1}{2}$ x $\frac{1}{2}$ -in. shelf angles are shop-riveted at 3-ft. 6-in. intervals to angle-iron clips, which in turn are field-bolted to the lower flanges of the spandrel I-beams. In the horizontal

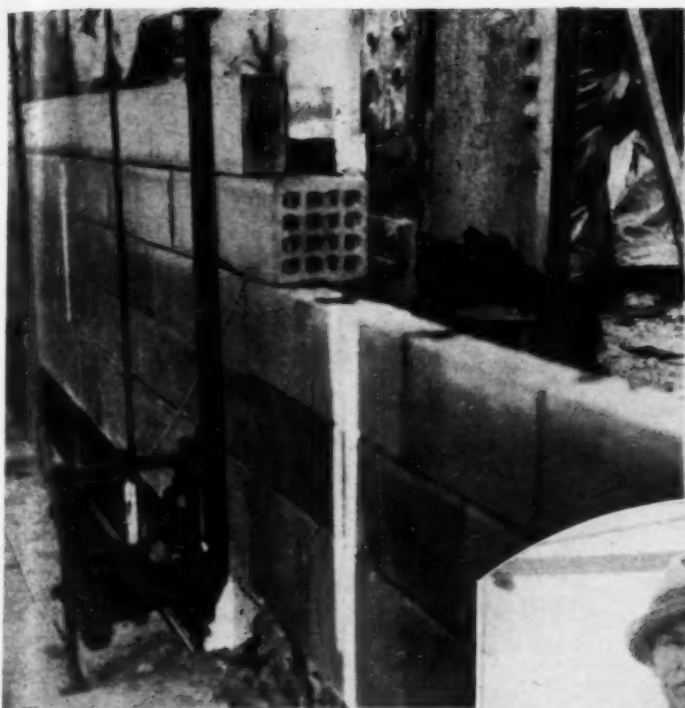


SPANDREL FACING, showing how blue-green terra cotta blocks are carried by I-beam and bonded to brick.

band is made up of six courses of blocks, one of them of double-size header blocks. For the prevailing 4-ft. 3 $\frac{1}{2}$ -in. width of colored band the blocks in the top and bottom courses are 9 $\frac{1}{4}$ in. and the intermediate blocks 8 in. high. The blocks are all 16 $\frac{1}{2}$ in. long and 4 in. thick, except for the header blocks, which have a thickness of 8 in.

Under the supervision of E. A. Gibbons, masonry foreman for Starratt Bros. & Eken, Inc., the blocks were laid up in 1:3 mortar with a 50 per cent admixture of lime to produce a "fat," workable mixture. A backing of common brick forms a thoroughly bonded composite wall with a total thickness of 1 ft. Each terra cotta block is anchored to the brick backing by a pair of galvanized steel wall ties with corrugated surfaces to produce a secure bond with the mortar. Over the top and bottom flanges of the I-beam spandrels asphalt waterproofing membranes extend into the masonry work to prevent leakage through the completed wall.

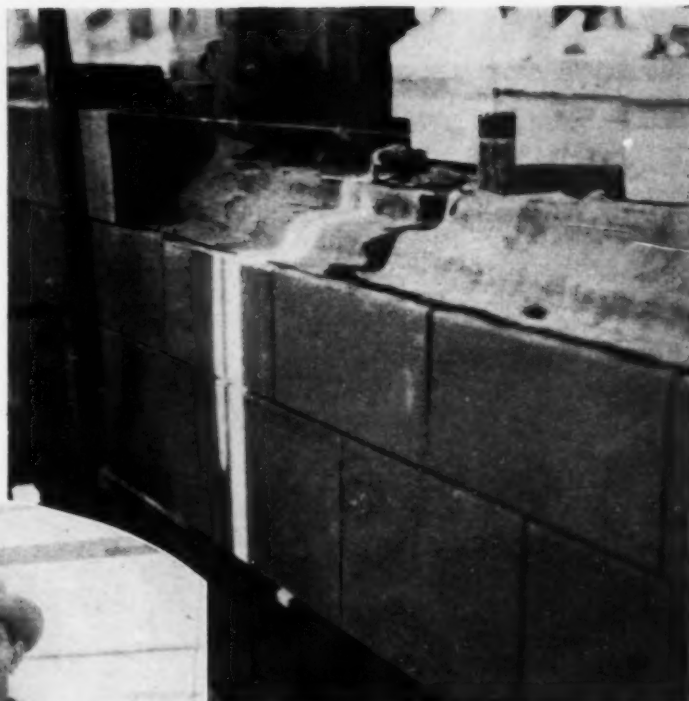
The top and inside faces of each block carry a mortar-bonding groove while the ends are "feathered," a special



HEADER BLOCK of terra cotta spandrel facing has width of 8 in.; other blocks are 4 in. wide.

patented feature producing a line of saw-tooth indentations which, when filled with mortar, form a tightly locked joint.

How Blocks Are Made—The glazed terra cotta spandrel blocks are machine-made by extruding a clay mixture through dies and cutting off the blocks to the proper length. After drying, and before burning, the blue-green glaze color is applied to the outside surface and the blocks are then fired for about 100 hours in a kiln at high temperature (2,200 deg. F.). This operation of firing the terra cotta and



WATERPROOFING MEMBRANE is extended from brick backing into joints of terra cotta facing blocks.



E. A. GIBBONS, masonry foreman for Starrett Bros. & Eken, Inc.

fusing the glaze color is carried on at a much higher temperature than is used for producing the ordinary hollow tile used in building work. After emerging from the kiln, the blocks pass through an automatic grinding machine which trues up the surfaces and insures accurate dimensions.

To prevent breakage during shipment from the factory at South Amboy, N. J., or while being unloaded and handled at the building, each block is individually encased in a corrugated pasteboard container, which is not removed until the masons are ready to lay the block in the wall. Designed generally for interior construction, these colored terra cotta blocks on the McGraw-Hill building represent the first large-scale use of this product as an essential structural element for the exterior of a skyscraper.



SHEET STEEL COVERING is applied to exterior columns and painted greenish-black, same color as mullions.



SHELF ANGLES, bolted to spandrel I-beams, carry terra cotta blocks and form window lintels.

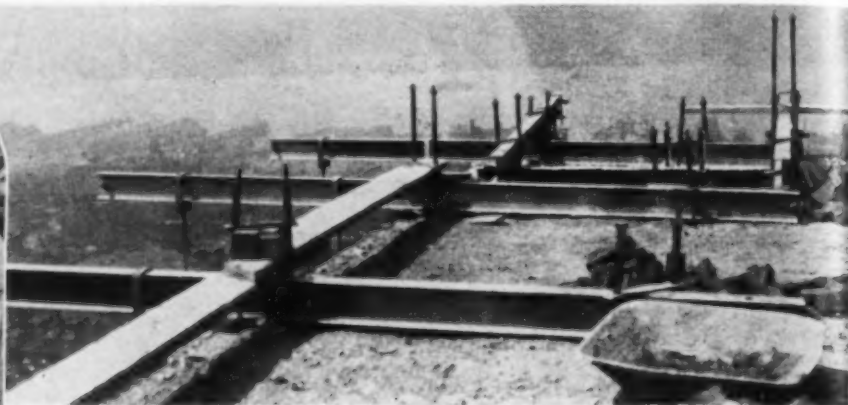
out in bold relief against a background of blue-green terra cotta beyond which the letters protrude 6 in. These name panel blocks, also the product of the Federal Seaboard Terra Cotta Corp., were of a wide variety of shapes and sizes, some of them (for the blue-green background) weighing as much as 400 lb., although most of the blocks were light enough to be handled by one man.

Like Solving Jig-Saw Puzzle—Obviously the sorting and setting of the panel blocks of various odd shapes and sizes presented the problem of a complicated jig-saw puzzle, calling for a high degree of skill and systematized delivery by Masonry Foreman Gibbons and his men. Each block was marked at the factory with a number corresponding to a key number on a plan.

The blocks were delivered by motor truck to the ground floor of the building and there carefully unloaded, sorted and sent up to the top of the structure in the proper sequence for installation by the masons. As many of the pieces forming the letters were of special curved or skewed shapes breakage would have been a serious matter, involving long delay for re-



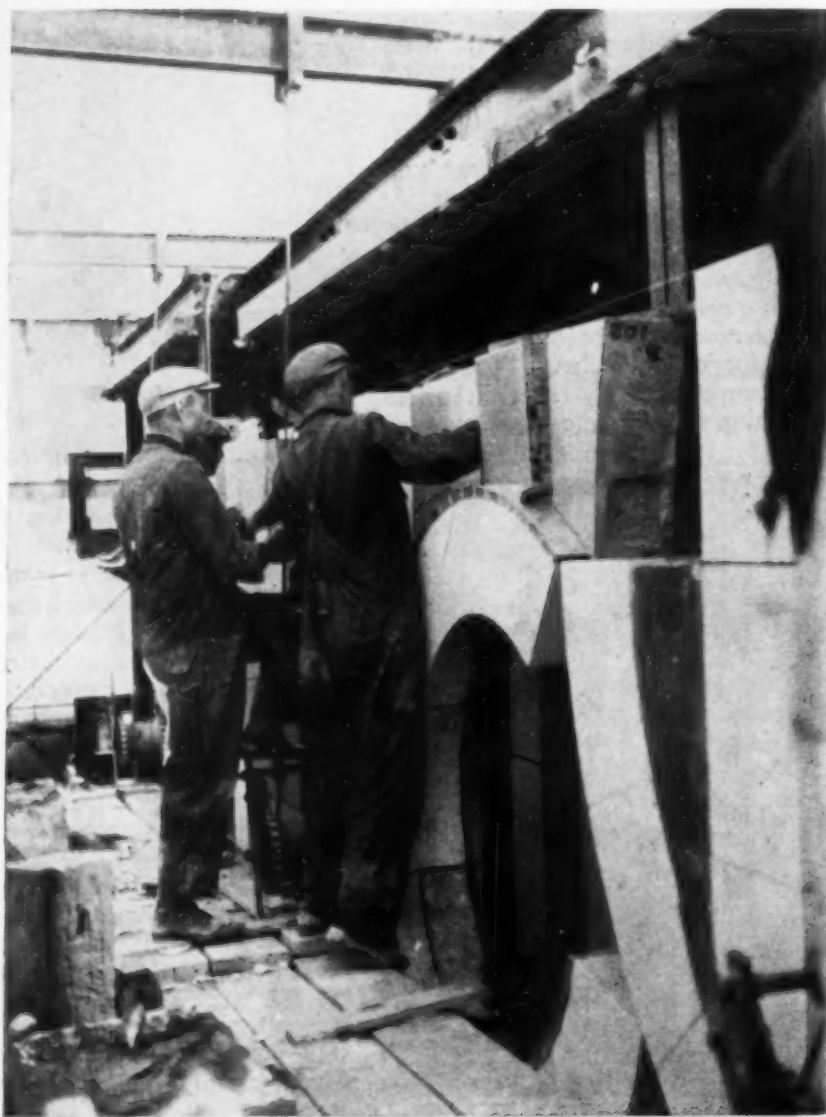
FLASHING of lead-covered copper sheets is applied to wall forming base of name panel.



THREADED BOLTS through concrete floor slabs anchor I-beams which carry the exterior masonry scaffolds.



NAME PANEL of special terra cotta blocks in white and orange protrudes from background.



MASONS on scaffold set terra cotta blocks of odd shapes and sizes to form name panel at top of building.

placements. Consequently extreme care had to be exercised in handling the pieces. At the factory they were packed in hay and after unloading at the job they were placed on cushions of hay in wheelbarrows which were raised to the top of the building in one of the platform hoists.

The accompanying pictures illustrate

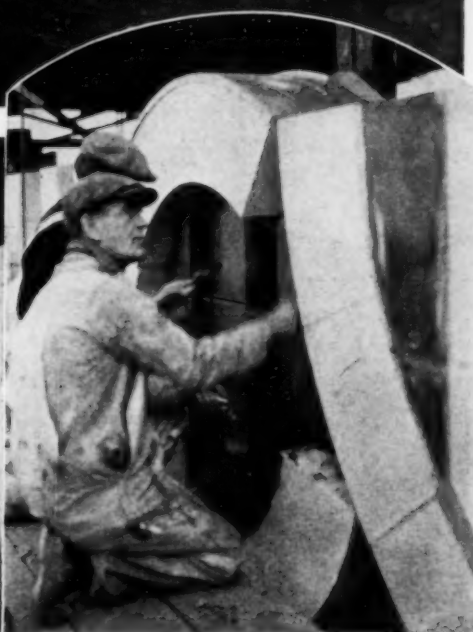
chrome enameled steel with bars of bronze and chromium.

The upper floors are serviced by four local and five passenger elevators with provision for additional elevators in both the local and express banks. The express elevators are of the full automatic, push-button, self-levelling type.

The entire 41st St. front of the

drel facing, are painted a greenish black, contrasting with the lighter blue-green of the terra cotta stripes.

The McGraw-Hill building was constructed by Starrett Bros. & Eken, Inc., from plans prepared by Raymond Hood, Godley & Foulhoux, architects, with Lockwood-Greene Engineers, Inc., responsible for the design of the



BACKING UP (at top) hollow terra cotta blocks for name panel with brick masonry wall. **POINTING** (above) orange colored vertical stripes of terra cotta on blue-green background.



SKEW-SHAPED BLOCKS of terra cotta are required for some of the letters in the name "McGraw-Hill."

the details of setting the name panel blocks. They are scored on their mortar faces and anchored to a brickwork backing by metal tierods. The openings in the backs of the blocks are filled with brick headers and mortar. At points where the contours of the protruding letters form pockets, lead-covered copper flashing strips are installed to exclude water from the wall.

Miscellaneous Features—The store fronts, building entrances and lobby of the new building are finished in poly-

building is designed for service and trucking. Wide openings allow eleven trucks to back against a loading platform. From the loading platform five freight elevators serve the basement and upper floors. A chute and conveyor system carry mailing bags and packages from the mailing room direct to waiting trucks at street level.

Windows are double-hung, without vertical mullions, in steel sash. Columns on the exterior of the building are faced with No. 12 gage steel sheets. The exterior surfaces of the columns and piers, forming vertical elements between the horizontal bands of span-

POCKETS in the 11-ft. high letters of the name panel are waterproofed by copper flashing.

steel frame for the 33-story structure, fabricated by the American Bridge Co. For the contractors A. H. Peterson was superintendent and H. R. Root project manager responsible for delivery of materials to maintain progress schedules; other assistants on construction were T. Shearman, J. H. Rothrock and F. D. Clark. For the architects Norman B. Baker was representative on the job. E. C. Maxwell was resident engineer on steel erection for the Lockwood-Greene organization.

By A. N. GEORGE
Resident Engineer
California Highway Department

Step-by-Step Salvaging Power Shovel

WHILE grading a $1\frac{1}{2}$ -mile section of La Canada-Mt. Wilson state highway in California, a 1-yd. 34-ton gasoline shovel of the T. M. Morgan Paving Co. went over the edge of an earth fill and overturned after running 70 ft. down the slope. The rugged nature of the topography through which the route passes is indicated by the fact that grading for the $1\frac{1}{2}$ -mile length of 30 ft. wide road required the moving of more than 500,000 cu.yd. of excavated material. As the shovel started its descent, the operator jumped clear and was unhurt.



1 OVERTURNED SHOVEL, weighing 34 tons, comes to rest after 70-ft. slide down slope of earth fill.



2 SALVAGE OPERATIONS start with the erection of a 40-ft. gin pole, guyed by wire cables.

Bids were requested from various wrecking companies for salvaging the shovel and that of Allen Bros., for \$800, was accepted. These contractors loaded salvaging equipment at their yard, 20 miles from the scene of the accident, one morning and after recovering the shovel, were back at the yard on the evening of the third day.

The major items used were: P&H 2-drum gasoline hoist mounted on a



3 A-FRAME, of two heavy poles lashed together at top, is raised into position on plank grillages with aid of gin pole. Two 2-drum hoists are mounted on truck chassis.

pneumatic-tired chassis; P&H 2-drum gasoline hoist mounted on a truck chassis; 6-wheel flat truck with small winch; 4-wheel flat truck; 40-ft. gin pole; two 50-ft. heavy booms used for

A-frame; and miscellaneous blocks and cables. The salvaging crew consisted of 10 men.

Two timbers, 12 ft. long and 12 in. square, were first planted about 7 ft.



4 FIRST HITCH made to upper crawler frame of overturned shovel. Hauling is done by two six-part purchases, one to A-frame and one directly to hoisting engine.

Field Methods

That Fell Down Slope

deep in the line of direct pull. A smaller anchor and a tree at right angles to the line of direct pull served as anchors for side guys.

The 40-ft. gin pole was first erected and with it the light 50-ft. pole was raised. The 40-ft. pole was then lowered, and the two heavy poles which were to form the frame and which were already lashed together at the top were raised. Their lower ends were placed on plank grills.

Two six-part purchases were used,



5 SECOND HITCH is made to forward end after shovel is turned right side up.



6 HEADED UP SLOPE. Crawlers turned in direction of pull and planks placed under treads.

one to each hoist. One of these purchases led from the top of the A-frame and the other led directly to a hoist.

The boom was removed from the shovel and the purchases were made fast to the upper crawler frame. The hoists were then started and the shovel was turned right side up. One pur-



7 NEARING TOP of slope. Lines to A-frame relieved crawlers of part of weight of shovel while lines direct to hoist furnished direct pull.



8 PASSING THROUGH A-FRAME, shovel ends its steep climb up the slope of the embankment.

chase was now fastened to the forward end of the shovel, and the machine was turned until the treads pointed up the slope. Planks were placed under the treads and the hoists were started. The purchase which led to the top of the A-frame took part of the load off the treads and prevented their digging into the soft slope while the other purchase made a direct pull. The shovel moved easily up the slope and on reaching the top was passed through the A-frame and placed in the roadway.

The boom was then brought up. The shovel was found to have suffered little damage, except to the cab, and within about a week was at work again.

The grading contractor had his equipment insured by the U. S. Fidelity & Guaranty Co. under a policy covering damage by slides, upsets, falling rocks and fire. The underwriter paid for salvaging and repairing the shovel.



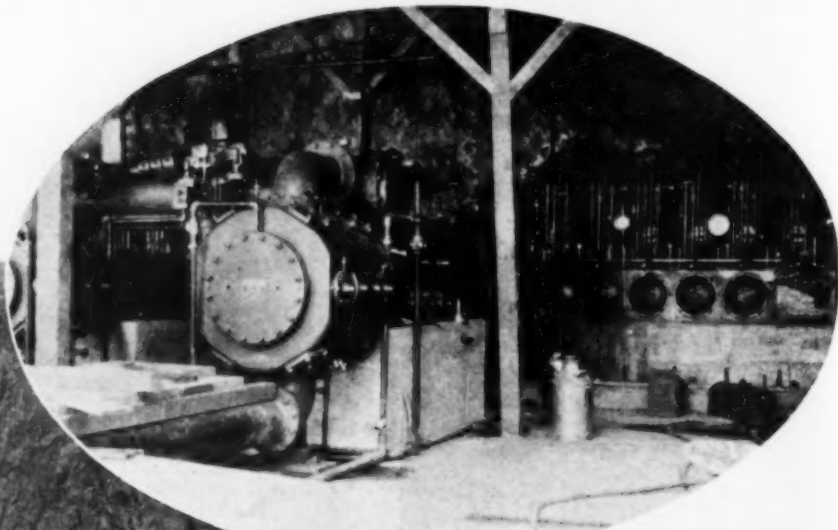
9 BACK ON THE ROAD. Shovel suffered little damage except to cab and was back at work again in a week.



Progress Continues at

HOOVER DAM

FOR SURFACING HIGHWAY to Hoover dam General Construction Co. delivers gravel by belt conveyor to overhead bin which loads motor trucks.



FIRST UNIT of the 25,000-cu.ft.-per minute air compressor plant which Ingersoll-Rand Co. is installing for Six Companies, Inc.



COLORADO RIVER CANYON, looking downstream from Arizona side, showing building to house air compressor plant for driving diversion and spillway tunnels and contractors' mess hall and bunk-houses, in lower right hand corner.

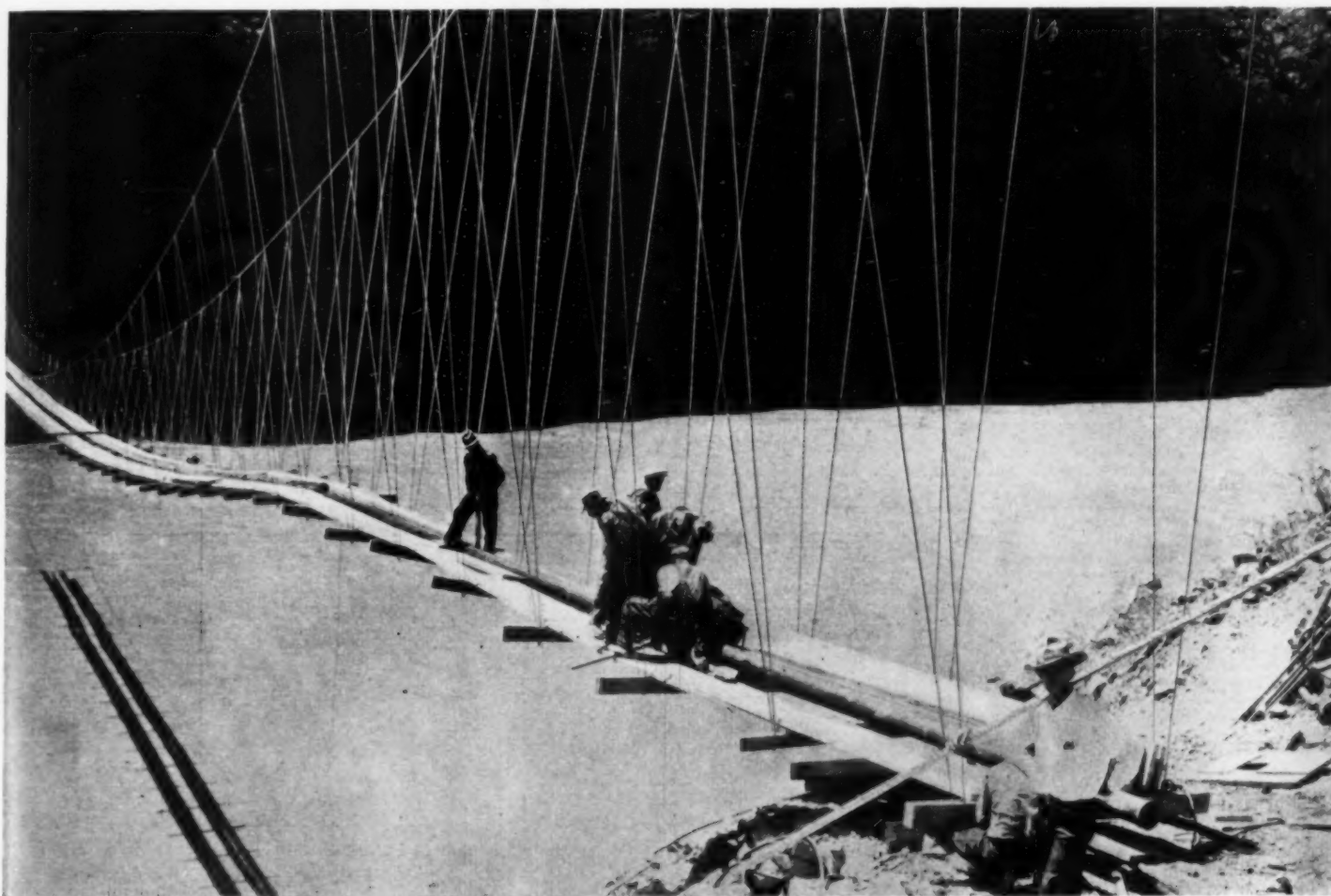
*Photos by W. A. Davis
Las Vegas, Nev.*

PORTABLE COMPRESSOR (right) for railroad construction along canyon near damsite is delivered by barge and hauled up steep incline by block and tackle to location about 100 ft. above water level in Colorado River.





TUNNEL CONSTRUCTION for single-track railroad line to serve dam is handled by J. N. Gordon, under sub-contract with Lewis Construction Co. This line extends from connection with Union Pacific R.R. at Boulder City to the damsite. Tunnel section is 18x26 ft. and requires timbering.



SUSPENSION BRIDGE is built by Six Companies, Inc., to provide Colorado River crossing about $\frac{1}{4}$ mile upstream from site of Hoover dam. Structure will carry compressed air line to drills in diversion and spillway tunnels on Arizona side of stream.

POWER LINE *to Hoover Dam*

TO DELIVER power for the construction of the Hoover dam on the Colorado River, the Southern Sierras Power Co. has completed a steel tower transmission line extending 230 miles from San Bernardino, Calif. Bases for the towers are first completely assembled and set in the earth. On the base sections the vertical members are erected and diagonal bracing added as the construction men ascend the poles. A

built-up top section, with arm members, is hoisted and bolted into place. Approximately 500 bolts are required for the assembly of one of these towers. Holes for the tower bases are excavated with motor-driven earth augers.

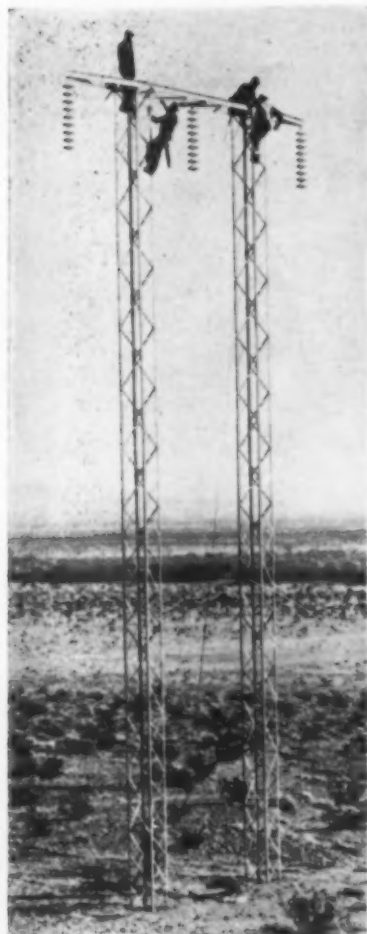
The work was done by the power company with its own forces under the direction of R. H. Halpenny, electrical engineer, E. J. Waugh, construction engineer, and C. H. Rhudy, in charge of field operations.



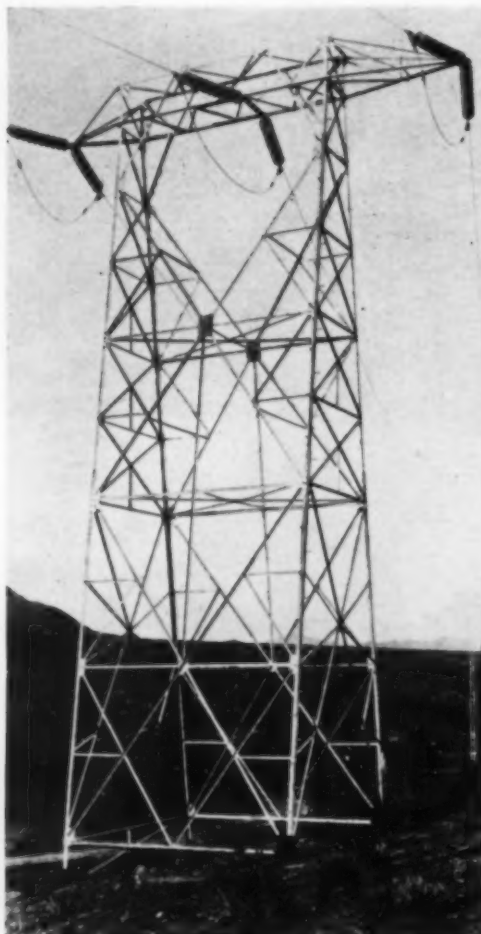
BASES for H-type towers are bolted to setting templates and lowered into holes. Metal is protected by dipping assembled base in hot asphaltic bath.



EARTH AUGER on tractor excavates holes for base sections.



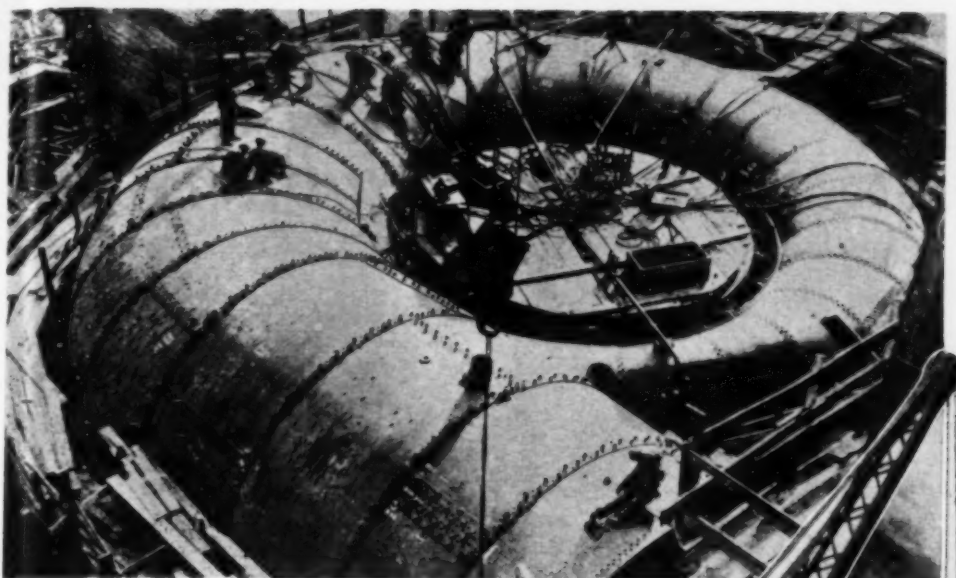
H-TYPE TOWERS of steel carry power line 230 miles from San Bernardino, Calif.



HEAVY ANGLE TOWER is special type for line transportation.



VERTICAL MEMBERS of tower are stiffened by diagonal bracing bolted into place.



LIKE A GIANT SNAIL a steel scroll case is assembled for one of the nine 84,000-hp. hydraulic turbine-generators of the Dnieper River power plant in Russia which will develop 750,000 hp. Spiral casing is of 1½ in. steel plate and measures 68 ft. at its widest point.

©Wide World

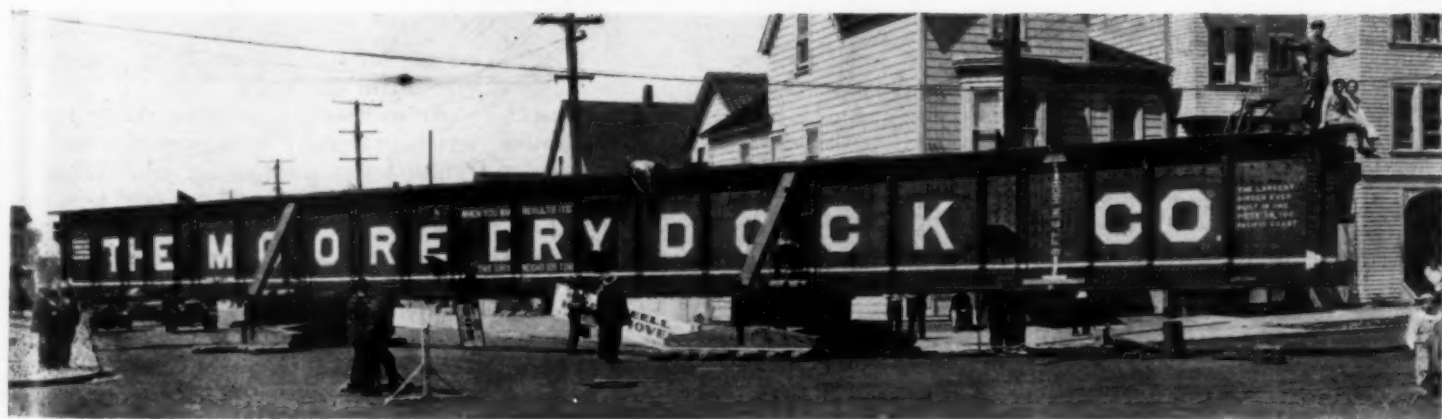
©Kopfons

JOB ODDITIES

A Monthly Page of Unusual
Features of Construction

WRECKING
of obsolete
freight cars at
M.K.T. yards in
Parsons, Kan., is
done by American
crane equipped with
Hercules wire rope
which lifts heavy car
bodies from trucks.

DRILLERS, suspended by cables, put finishing touches on sculptured head of George Washington for Mt. Rushmore Memorial in Black Hills of South Dakota.



GANGWAY FOR GIRDER! Heavy structural member for main balcony of new Paramount Theatre in Oakland, Calif., is skidded along city street. Length, 120 ft.; height, 9½ ft.; weight 120 tons. Girder was fabricated by the Moore Dry Dock Co., of Oakland, and is claimed to be the largest ever built in one piece on the Pacific Coast.

HEAVY ROCK WORK

on Tennessee Highway Job

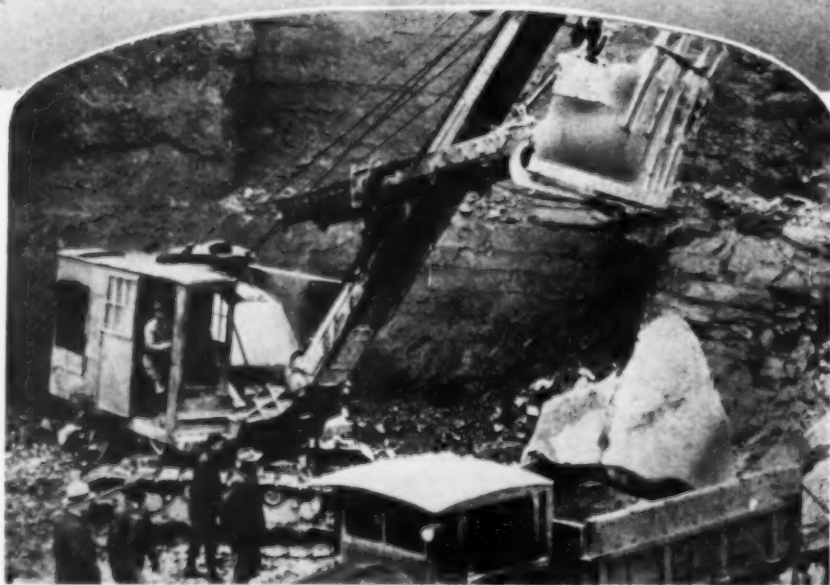


FLOATING HEAVY PLANT 30 miles down the river proved to be easier and quicker than any other means of delivery.

MORE than 215,000 cu.yd. of earth and solid rock excavation were moved recently in 3½ months, working day shifts only, on a Cumberland River bridge approach for the Tennessee State Highway Commission by John Oman, Jr., of Nashville, with a 1½-yd. and two 1½-yd. shovels served by crawler haulage equipment.

On account of the isolation of the job from rail and improved highway connections, the plant was loaded on barges and floated 30 miles on the river to reach the work. No dismantling was necessary. The shovels went on and off the barges under their own power. Care had to be taken to keep the load on the barges balanced while loading and unloading were in progress, but the whole movement was simpler than by rail.

Immediately adjacent to the river end of the job was a cut 103 ft. deep of more than 43,000 cu.yd. in hard, tough limestone. This would have been an ideal well-drill operation, but the work was started on very short notice. It also was necessary to keep an old road, that was nearly on the



LOADING 6-TON ROCK into crawler truck with chain on shovel dipper. Much mudcapping was saved by handling big rock this way.

new location, open for the delivery of supplies to the part of the job beyond. So all of the holes on this cut were sunk with jackhammers to the right depth to permit the rock to be taken out in 20-ft. lifts. On account of the hard, tough rock only 12 in. could be drilled, on the average, before a fresh bit was required. Under these handicaps one shovel finished this cut in 52 days.

On all of the rest of the job well drills were largely used to put down holes from 20 to 42 ft. deep, with the average around 30 ft. While steep slopes made the handling of these outfits difficult, it was possible to sink ac-

curate holes with them by guying the frame and the leads.

An overburden of loose, shaley material prevented springing the well-drill holes on most of the job. Where this occurred, 60 or 75 per cent gelatin was used in loading. The jackhammer holes were loaded with as much as 100 lb. of dynamite, while the loads for the well-drill holes ranged from 100 to 400 lb.

Use of the high-percentage explosive resulted in thorough shattering and fragmentation of the tough rock, enabling the shovels to handle the spoil faster and easier. No more care had to be used in handling the high-per-

MUD BOTTOM (right) in big rock cut is negotiated easily by crawler haulage equipment. Other types of equipment would soon have made this going impassable in wet weather.



DUMPING BIG ROCK (below) from crawler wagon. No more care was used in handling a load of big rock than in regular run of excavation spoil.



centage explosive than with the ordinary grades. For the well-drill holes the dynamite came in sticks 5 in. in diameter and weighing 10 lb. to the stick, with five to the box. These large sticks were loaded with very little cutting.

In spite of a good deal of heavy clay mud that worked into the rock cuts, the crawler tractors and crawler wagons were operated steadily, except when it was actually raining. J. P. Burns, superintendent for the contractor, considered that he got in much time with them when round-wheel outfits would have been stalled.

With two 10-ton crawler-mounted Linn trucks and four Athey crawler wagons, having three-way dump bodies, it was possible to remove almost any of the pieces of rock the shovels could swing. Rock pieces weighing up to 8 tons were loaded into the dump bodies by using chains on the shovel dippers. With the plan of drilling and shooting used and the handling of the big rock by the shovels, very little mudcapping had to be done. This not only saved money but also speeded up the shovel work a good deal.

No trouble was experienced in dumping the large rock from the crawler wagons right out on the end



of the narrow top of a fill near the bridge that had a maximum height of 55 ft. In fact, the wagons took no longer to dump a load containing a large rock than one of the ordinary run of the cut. The Monarch and Caterpillar tractors used also were handled easily on the high, narrow fill.

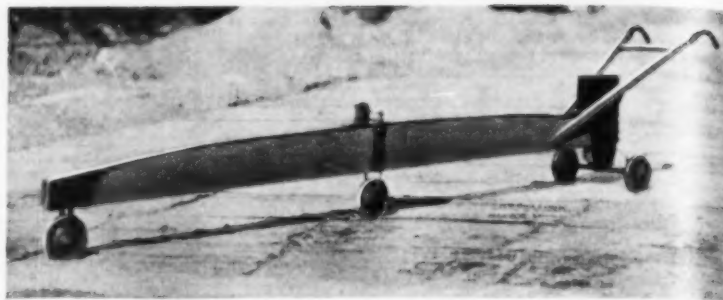
R. H. Baker is commissioner of the Tennessee Department of Highways and Public Works. T. C. McEwen is state highway engineer and E. M. Turner, assistant state highway engineer in charge of construction. J. P. Melvin was resident engineer on the project.

WELL DRILL (left) sinks 42-ft. hole on side-hill slope so steep that frame and leads of machine had to be guyed. **CONSTRUCTION PERSONNEL (below)** includes J. M. Farrar (at right), engineer manager of Tennessee Road Builders' Association; S. Oman and J. P. Burns of the John Oman, Jr., organization. The workmen at the left are handling 5-in. 10-lb. sticks of 75 per cent gelatin.

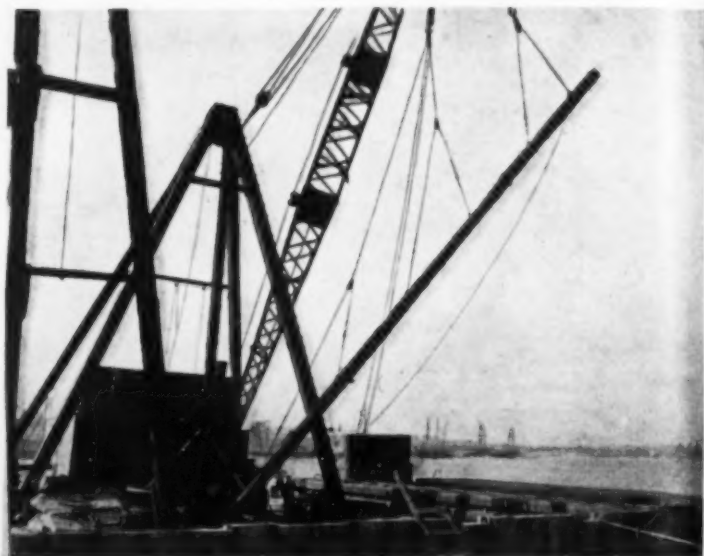


Getting Down to DETAILS

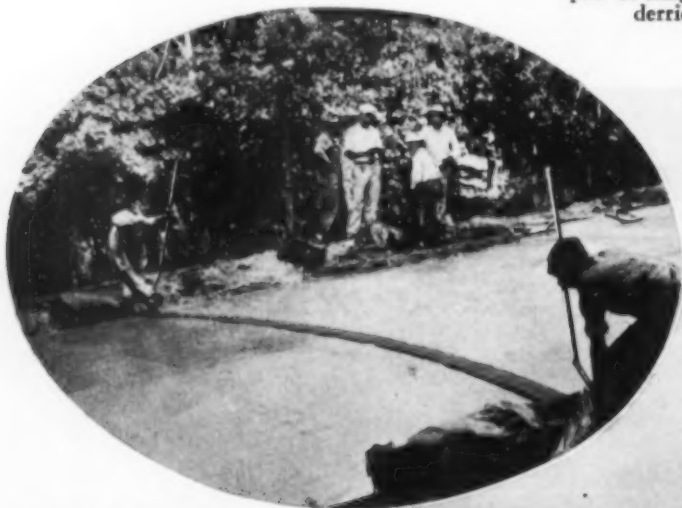
[[Close-up Shots of
Job Methods and Equipment]]



BUMPOMETER for pavements in Ohio to measure surface irregularities. Length 10 ft. Buzzer, operated by dry cell, sounds when center wheel passes bump or depression. Contractors are using this equipment to check their paving work.

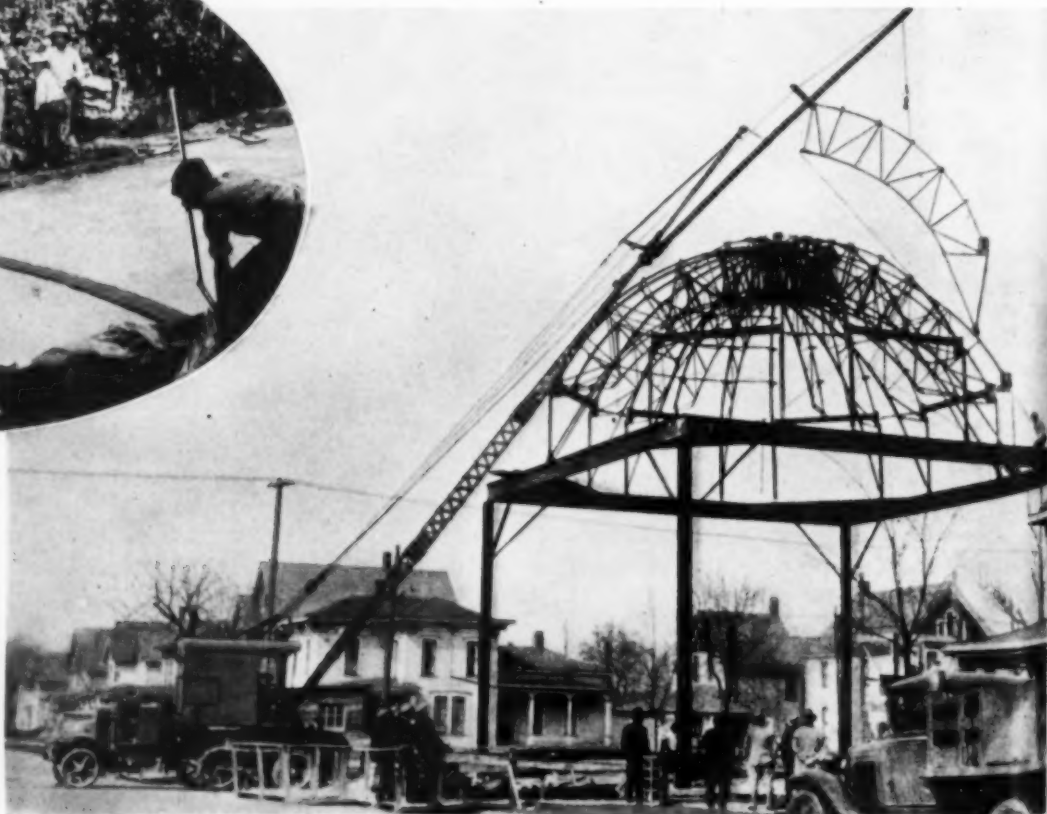


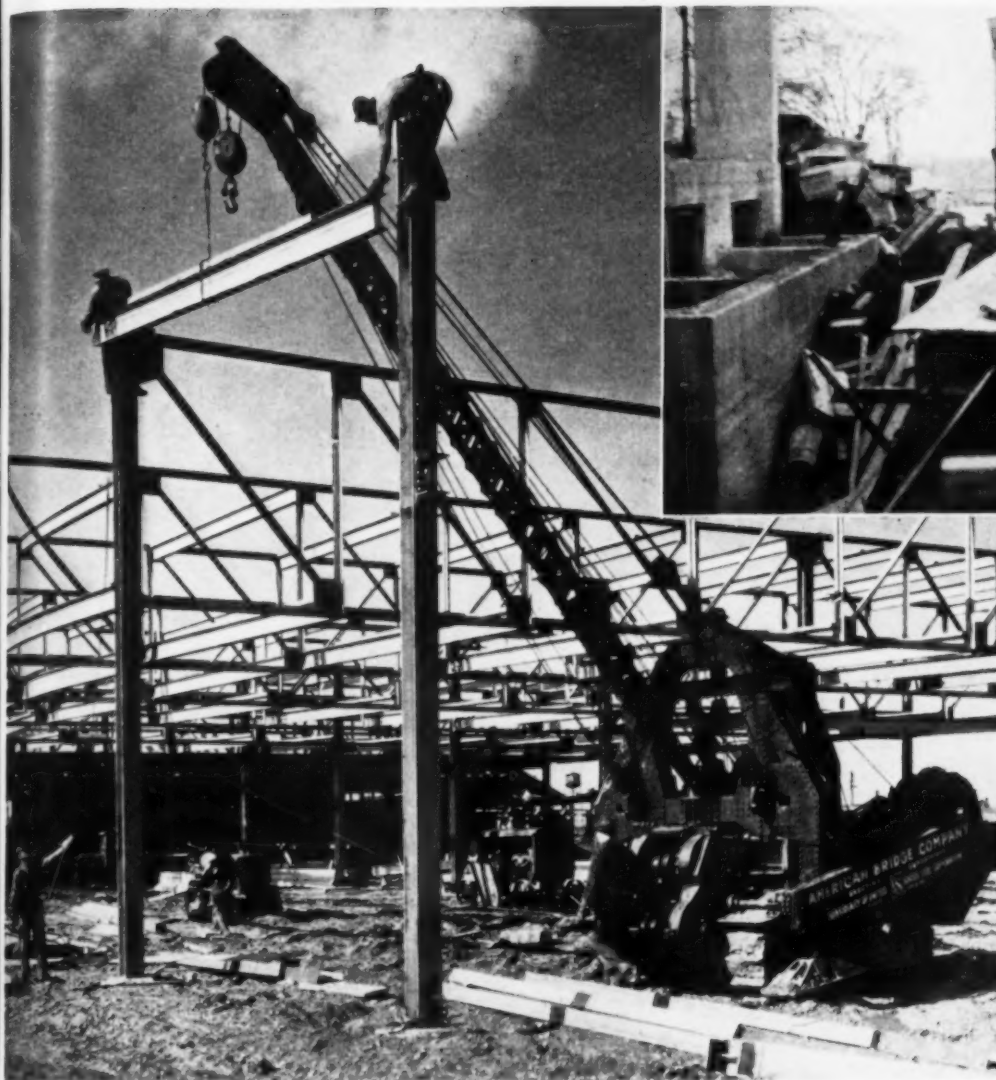
FOR HANDLING 82-FT. CONCRETE PILES at municipal dock in Los Angeles, Merritt-Chapman & Scott Corp. used rigging consisting of slings attached at six points along each 23,000-lb. pile to prevent bending. Two pairs of slings are attached through blocks to second sling connected through block to main fall of 20-ton derrick. Remaining pair of slings at right end are connected through block to auxiliary fall from tip of derrick boom. In vertical position, pile is handled by special sling attached one-third of way from top.



LONG HANDLES (above) on belt facilitate finishing of 38½ miles of concrete paving in Missouri by Hoeffken Bros. Construction Co., of Belleville, Ill.

EXTENSION ON BOOM (right) of Universal truck crane enables Vogt & Conant, of Cleveland, to erect from street setup all steel trusses for Jewish Temple in Lorain, Ohio. Boom length is 50 ft., extension, 16 ft., and auxiliary jib, 45 ft.





BOX ENCLOSURE (*above*) allows cables of elevator hoist to extend through sand pile, thus utilizing valuable storage space during construction of 3-story concrete postoffice building at Spartanburg, S. C. Contractor, Algernon Blair, of Montgomery, Ala.

STEEL-ERECTING BOOM (*left*) is rigged on Caterpillar tractor by American Bridge Co. at new building for Raymond Bag Co., Middletown, Ohio. Boom length, 30 ft.; capacity, 5 tons. Rig is easily knocked down for shipment.

ROAD FORMS DOUBLE-DECKED (*below*). W. A. Wilson & Sons place 7-in. high Blaw-Knox units one on top of other to get 14-in. thickness on concrete resurfacing job in West Virginia.



LARGE PIPE CONNECTED UNDER PRESSURE. On 30-in. main at Ogdensburg, N. Y., a 30-in. horizontal valve was inserted and a 24-in. branch connection made using A. P. Smith apparatus, without interruption to water supply service. Operation is performed with bevel gear pipe cutter, sleeve and split casing equipped with dome into which cutting mechanism and cut-out section of pipe are lifted.

The Superintendent Discusses

MOVING THE SHOVELS

"I was just over at the tractor sheds," Jim, the general superintendent, remarked as he and Bill, the "super" in charge of the Sumps Corners job, started out one morning to look over the shovels. "Six of the tractors appear to be off duty today."

"That's right," replied Bill. "Eight seems to be enough to keep the two shovels busy."

"So you sent the other six to the sheds?" "Yes."

"On the theory that it costs too much to pay for drivers, gas and oil, to say nothing of depreciation and possible repairs?"

"Certainly."

"That's reasonable enough, Bill. Sending out extra hauling units is far too expensive to be warranted. As a matter of fact, the practice is a relic of the time when pretty much all of this sort of work was done by teams and wagons. It cost so nearly the same to feed the mules and the mule skinner when they were doing nothing as it did to work the wagons, that the practice of sending all of them out, whether they were needed or not, became quite general. Then, too, in the days when wagon outfits were common, as a rule digging was pretty light. This resulted in such rapid changes in hauling conditions that it wasn't always possible to tell how many teams could be used. At any rate, it was customary to send all the wagons out and now, though trucks or tractors have replaced most of the mules, a good many contractors still follow this practice. Of course, it's quite unsound to operate in this way, for grading usually runs a good bit heavier now, haul doesn't vary much during a single day and the difference between the cost of operating a big truck or a big tractor and the cost of letting it stand idle is a good deal more than the difference between the cost of working a team and the cost of letting it lie idle. So it always is well to send out only the hauling units which can be worked to capacity."

"But, Bill, your tractors ought to be at work."

Bill was quite taken back. He realized of course, that handling a grading job, like playing bridge, involved a good many points one didn't learn without a lot of experience and a good deal of study. Still, for the "general" to say that all of the tractors should be at work when eight could keep the shovels busy didn't seem reasonable. So he replied quite frankly and a bit abruptly, "I don't get you at all, Jim. The shovels can't turn out any more dirt than they're handling right now and eight tractors are taking it easily."

"Quite likely," was Jim's rejoinder. "Quite likely."

"Then why should we send out the other tractors?"

"Could move one of the shovels, couldn't you?"

"Never heard of such a thing!" Bill was more amazed than ever. "Why should we move one of the shovels?"

"Why not?" Jim was enjoying the fact that he had Bill guessing.

"Why not? Why it takes time to move a shovel and that costs a lot of money."

"Sure enough. But is time the only thing that costs money?"

"No."

"Then might there not be other things that would cost more than moving a shovel—letting it work for a couple of weeks at half its normal output, for instance? Knew a fellow once who got his shovels so badly tangled up that for more than a month three of them didn't average 100 cu.yd. each a day. I figure that, by the time he had added in the cost of depreciation, just digging the dirt he moved that month cost him over 50 cents a cubic yard. That's more than we're getting for digging, hauling, and placing combined!"

"How did that happen, Jim?"

"Easy enough. He had three good shovels and an average amount of hauling equipment, though I suspect that an average amount wasn't enough for that job. At any rate, he started his shovels at three points where it seemed that an easy start could be made. For a month or two he got along pretty well and then, without knowing just how it happened, he found that all three of the shovels were working on dirt which had to be hauled about a mile and, well, Bill, what I am wondering about is whether you will have tractors enough next week when, if you keep the shovels moving right along where they are now, you'll be hauling about 2,000 ft. from one of them and over 2,500 ft. from the other?"

"No, Jim, we'll be short of tractors, all right, when we come to that part of the work."

"But why not duck that situation, Bill, by moving one shovel over on to the long haul work now? Then you can run four tractors with the shovel you leave where it is now and there will be ten for the long haul work if you need that many. If you wait till both the shovels are on long haul, the tractors can't take the dirt as fast as the shovels can dig it."

"I'm beginning to see what you're driving at," was Bill's comment. "Never heard of such a thing before, but I must admit it sounds logical."

"It is logical." Jim's manner had changed. Quite evidently he was in dead earnest now. "It's so logical that it often means the difference between a loss and a good profit on grading work. You know as well as I do that on grading work of this sort there are some cuts which involve only a short haul. Some of the dirt must be hauled a long distance. Usually most of it must be hauled about the average distance. Almost obviously it is impractical to send out enough hauling equipment to keep two or three shovels busy at the same time on dirt which involves the longest haul a



S TO KEEP HAULING UNITS BUSY

job of this sort develops. But it is practical to study the whole job and to place the shovels so that either a long haul and a short haul, or two intermediate hauls are being worked at the same time. Then, if enough hauling equipment is provided to handle the output of the shovels when the haul is of about average length, usually it is possible to keep the shovels working at pretty near full production all the time.

"So, Bill, what I'd like to have you do is to study the hauling problem on this job to see if it isn't possible to put one shovel on short haul work whenever

Jim Tells Bill How to Get the Maximum Output From His Fleet of Tractors

it is necessary to have one on long haul work. That's the only way to keep production where it should be, and it's the surest road to a good profit."

"We'll have to move the shovels around quite a bit if we operate that way!"

"True enough. It will take some pretty

careful planning, too. But, after all, it isn't hard to move a shovel. An hour or two is time enough to move one quite a distance and once the shovel runners become accustomed to the idea, they will be careful to prepare all pioneer roads with this in mind."

"Perhaps you may have noticed, Bill, that we almost never send less than two shovels to a job."

"Yes, I've noticed that, Jim. Why is it?"

"Well, more or less confidentially, Bill, it's because the two-shovel set-up has so much advantage over the one-shovel set-up that as a rule, we can make a profit with a two-shovel outfit where a man with a one-shovel outfit can hardly make a cent. He has no means of adjusting his outfit to work economically on the various hauls—particularly the long ones. On these, invariably, the one-shovel outfit finds the work expensive, for the shovel cannot be kept up to a capacity output. On the short hauls equipment has to be laid up and on a lot of jobs too many hauling units are sent out. So on both long haul work and short haul work the one-shovel outfit seldom gets the results it is rather easy to get with a two-shovel outfit if the shovels are moved about on the job so that all of the hauling equipment can be kept busy."

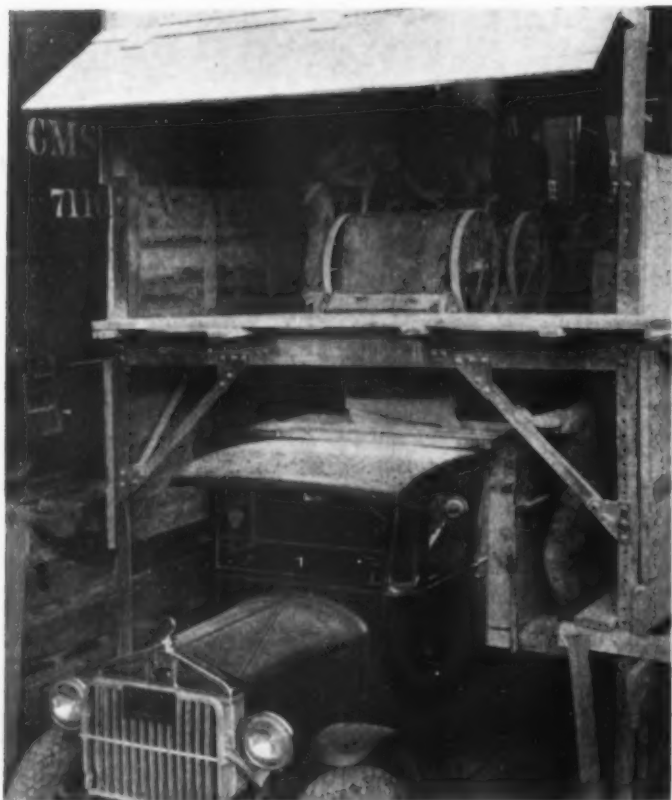
"In other words, this is one of the places where that 'thinking your way through to a profit' comes in," Bill observed.

"That's just it," replied Jim. "You figure out a plan under which both the shovels and the tractors can be kept at full production during the largest part of the time, and then you move both the shovels and the tractors around on the job as much as is required in order to keep production at top speed all the time."

"Well, Jim, I'll go right to work on that idea. We've had good production so far but I've been worrying about how to keep it up. This is the answer. But it's come just in time. In another week we'd have had some low production."

Jim merely smiled. He had had his own reasons for letting this matter rest till Bill was almost in a hole—and they remained his own. But that was one of the reasons he was a general superintendent.





BULK CEMENT HANDLING PLANT consists of a 12x24-ft. adjustable steel frame, a scale and three movable chutes which travel between two tracks carrying cement carts. Carts are loaded at cement car, weighed and placed over chutes. Steel apron, attached to bottom of cart and hooked into chute, facilitates dumping of cement into boxes on truck beneath with minimum of dust. Plant operated by four men can handle 500 to 600 bbl. of cement a day. — George O. Harm Co., Warren, Ohio.



TRACTOR CRANE, truck-mounted (*left*), has rated capacity of 4,000 lb. and travels at rate of 12 miles per hour. Boom easily adjusted from operator's seat. Counterweight, 2,000 lb., bolted to rear of machine, gives better traction and stability and spring-mounted chassis prevents excessive shocks and strains. Special attachments include shovel, sweeper, plow and bulldozer. Special telescopic mast. — Lidgerwood Manufacturing Co., Elizabeth, N. J.



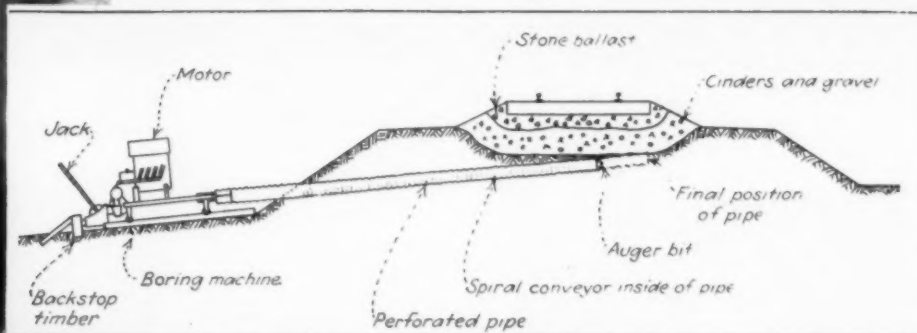
FULL - REVOLVING SHOVEL (*left*) has stationary power plant which eliminates tail swing and enables machine to work in close quarters with ease and speed. Finger-tip control assured by hydraulic clutch and brake mechanism. Dumps at any point and digs in three-quarters of circle. Also performs as dragline or crane. — Michigan Power Shovel Co., Benton Harbor, Mich.

NEW EQUIPMENT *on the Job*

FLEXIBLE ALL-STEEL COUPLING, designed for shafts up to 1 in. in diameter, consists of two sprockets wrapped by a chain provided with large pins for maximum strength and ease of coupling and uncoupling. Connecting pin may be removed without use of tools. By use of cotter pins coupling chain is connected after shafts are aligned. Requires minimum of shaft space. Lubrication unnecessary. Any standard bore can be used with either flat or cup section. — Morse Chain Co., Ithaca, N. Y.



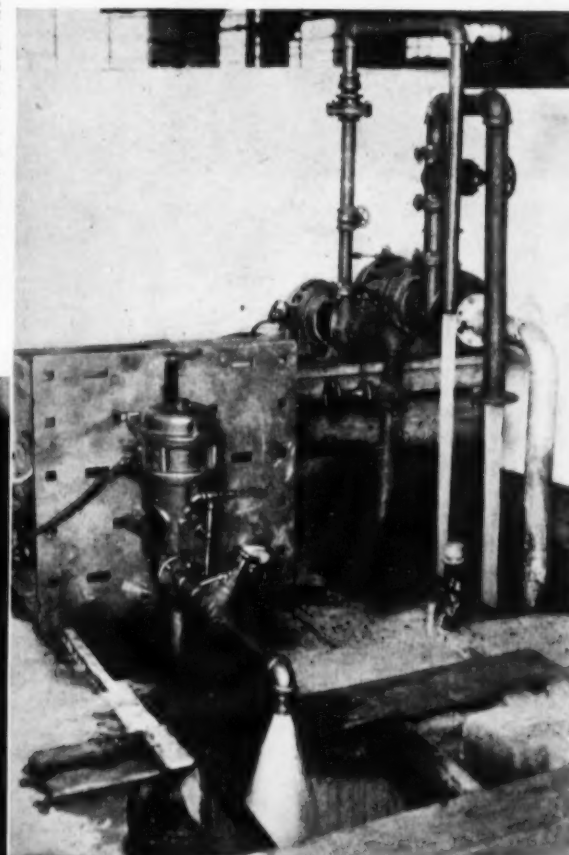
PRESSURE ROAD OILER, built to distribute oil at proper temperature. New features include accurate volume gage; one-man control; heating unit built into tank; and swivel manifold extensions which permit shortening or lengthening of spray bar as desired. Furnished with 25-gal. fuel tank. — Sacramento Engineering and Machine Works, Sacramento, Calif., manufacturer; Edward R. Bacon Co., Folsom, 17th St., San Francisco, distributor.



BORING MACHINE (left and above) for installing corrugated iron drain pipe of 8-, 12- and 18-in. diameters. Excavates and removes material displaced by pipe. Machine mounted on track upon which it moves forward as jacking progresses. Jacking is done by hand. Power provided by gasoline motor and transmitted to borer by shaft extending through pipe. Spiral conveyor built round shaft removes spoil through pipe upon metal trough placed in invert. When section of pipe has been placed, machine is returned to starting point, another section of pipe and a corresponding length of lining and conveyor attached and the process repeated. — Armco Culvert Manufacturers Assoc., Middletown, Ohio.

TAPE-RULE (right) measuring at an angle to determine length of brace. Combines convenience of pocket tape and utility of rule. Winds into 2-in. case. Becomes rigid when withdrawn. Line or rule blade is of tempered steel stiffened by special forming. One type of "Crescent" rule marked inches to 16ths; one marked feet, 10ths and 100ths of foot. —The Lufkin Rule Co., Saginaw, Mich.

TUNGSTEN CARBIDE COMPOUND (below), known as Armité Autoweld, for over-all hard-surfacing of any type of steel. Applied with electric arc using negative carbon electrode. Supplied in $\frac{1}{4}$ -in. diameter 10- to 11-in. long sticks. —Armité Laboratories, 318 West Ninth St., Los Angeles, Calif.



CENTRIFUGAL PUMP, a Cameron general service unit. Pump and electric motor assembled together, producing compact, light-weight, machine, easily handled. Designed for operation against moderate heads. Suitable for operating circulating and cooling systems in factories, warehouses and apartment buildings. Made in six sizes and mounted on structural steel bedplate to facilitate installation. — Ingersoll-Rand Co., 11 Broadway, New York City.

Present and Accounted For —

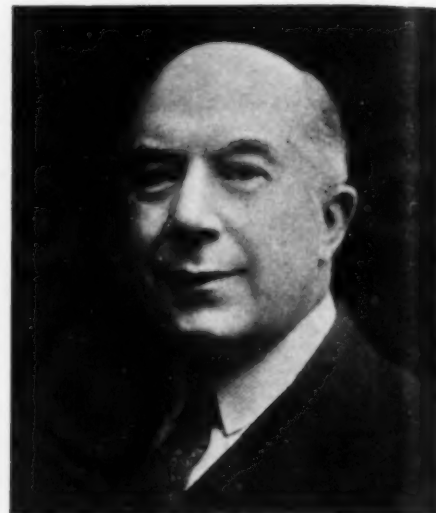
A Page of Personalities



R. L. DOBBIN is the newly elected president of the American Water Works Association. He is superintendent of water works at Peterborough, Canada, and served as chairman of the association's committee on constitution.



COL. HUGH L. COOPER, American consulting engineer, is serving as technical adviser to the Soviet government in Russia on the construction of the Dnieper River dam and hydro-electric project to develop 740,000 hp., at cost of \$110,000,000.



GEORGE H. FINNERAN, who is serving this year as president of the New England Water Works Association, is superintendent of the Water Division of the Public Works Department of Boston, Mass.



HON. MICHAEL A. CONNOR, building contractor of Hartford, Conn., and member of the Associated General Contractors of America, has twice been elected to the State Senate of Connecticut. Senator Connor is a graduate of Trinity College and served ten years with the Berlin Construction Co. before establishing his own business, The Michael A. Connor Co.

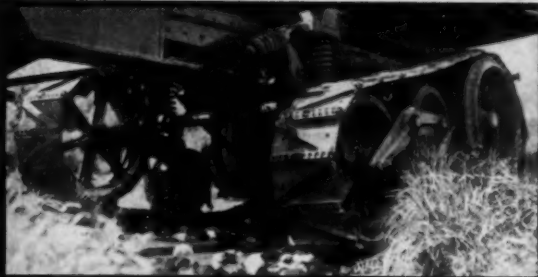
HOOVER DAM EXECUTIVES CONFER. Frank T. Crowe (*below, left*), general superintendent for Six Companies, Inc., successful bidders on the \$49,000,000 Colorado River project, discusses provisions of contract and specifications with Walker R. Young, representing the U. S. Bureau of Reclamation as Construction Engineer.



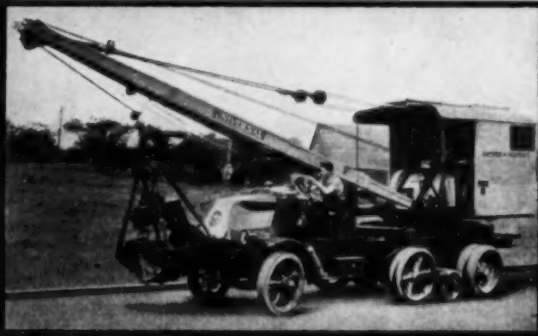
Motor Truck Speed
for travel on
paved roads.



Crawler traction
for travel through
mud, or over un-
even ground.



Eight rubber tired
wheels support
the load—strictly
in keeping with
modern reduced
wheel load re-
quirements.



Crawler treads
that go on or off
as quickly as a
set of tire chains.



THE MOTOR TRUCK (CHRISTIE) CRAWLER

Equipped with "Christie Crawlers," Universals can travel to crane jobs anywhere. Christie Crawlers for truck cranes are applied exclusively on Universals.

THE UNIVERSAL CRANE COMPANY
LORAIN, OHIO

UNIVERSAL



On this excavation job in Newark, N. J., five Cleveland Paving Breakers make demolition both fast and easy.



H7
SINKER



C7
PAVING
BREAKER

Make the job Easier with these Cleveland Tools

Back savers as well as time savers, are these Cleveland tools. They take the load off the man and put it on the machine.

The powerful C7 Paving Breaker, for example, demolishes more pavement or concrete in an hour than one man alone could do in a day. And it does it with a minimum of air and effort.

The H7 Sinker puts down a hole in less time and with less trouble than by any other method. In small tunnel work and wherever hard pan is to be loosened, the CD5 Clay Digger is a man saver—as is the TD5 Trench Digger.

Amazing power and speed are features of all Cleveland Rock Drill tools. They make work easy—and they reduce costs as much as 75% over old fashioned hand methods. Let us demonstrate how these tools can lighten your work—and lower the cost of doing it.

The Cleveland Rock Drill Co.

3734 E. 78th St., Cleveland, Ohio

Branches, Agents and Service Stations in Principal Cities

CLEVELAND ROCK DRILLS

*Here's Your
DRILLER'S
HANDBOOK*

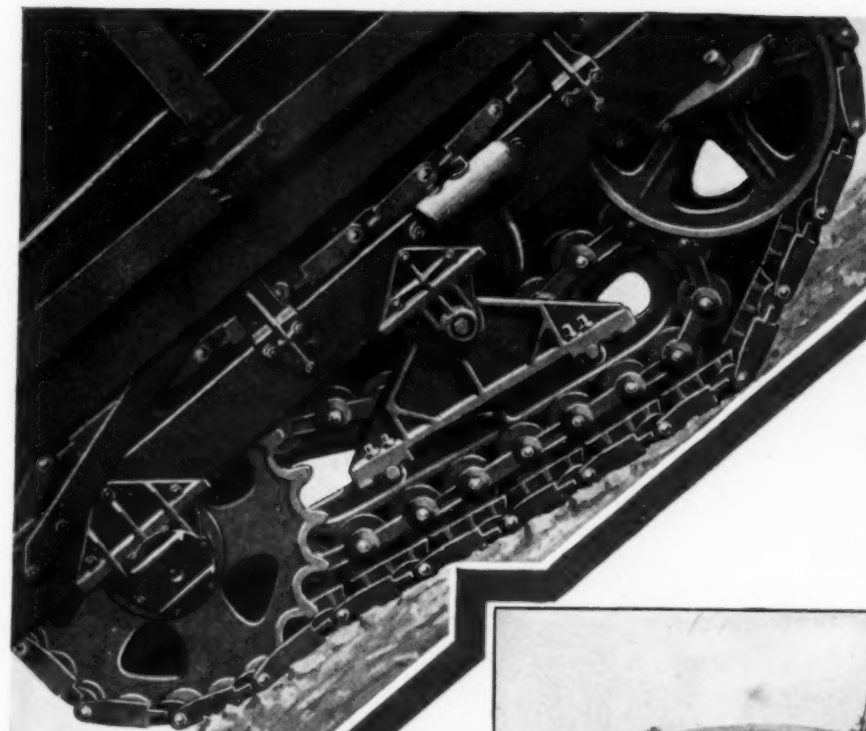


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FOR YOUR COPY?**

It's free to you if you are now using or expect to use, Rock Drills in the near future—133 pages of valuable information on drills, explosives, blasting, etc.,—offered with the compliments of the Cleveland Rock Drill Co.

Just send in your name, your company and address.

YOU CAN BANK ON THE LINN



Patent No. 1,270,531
 Patent No. 1,521,454
 Patent No. 1,685,841
 Patent No. 1,680,678
 Patent No. 1,701,979
 Other Patents Pending



Stuck? Trucks and tractors stranded? Expenses eating up profits? This would not happen with the LINN!

Different from the ordinary tractor, LINN carries a pay load on its own tracks and steers like a truck. Different from the truck, LINN, with its patented flexible traction, is able to go through muck and sand, up tough grades and rocky terrain . . . backward or forward . . . day in and out despite adverse conditions . . . assuring the LINN owner a real profit even on tough jobs.

See for yourself. Go to a LINN dealer and watch LINN perform. Write or wire for unbiased, certified Nielsen Surveys concerning LINN performance. You'll find, whatever your job, you can call in LINN for dependable, economical service.

A SUBSTANTIAL REDUCTION IN THE PRICES OF LINN TRACTORS IS NOW IN EFFECT

LINN MANUFACTURING CORPORATION

(Division of La-FRANCE-REPUBLIC Corporation)

Represented in:

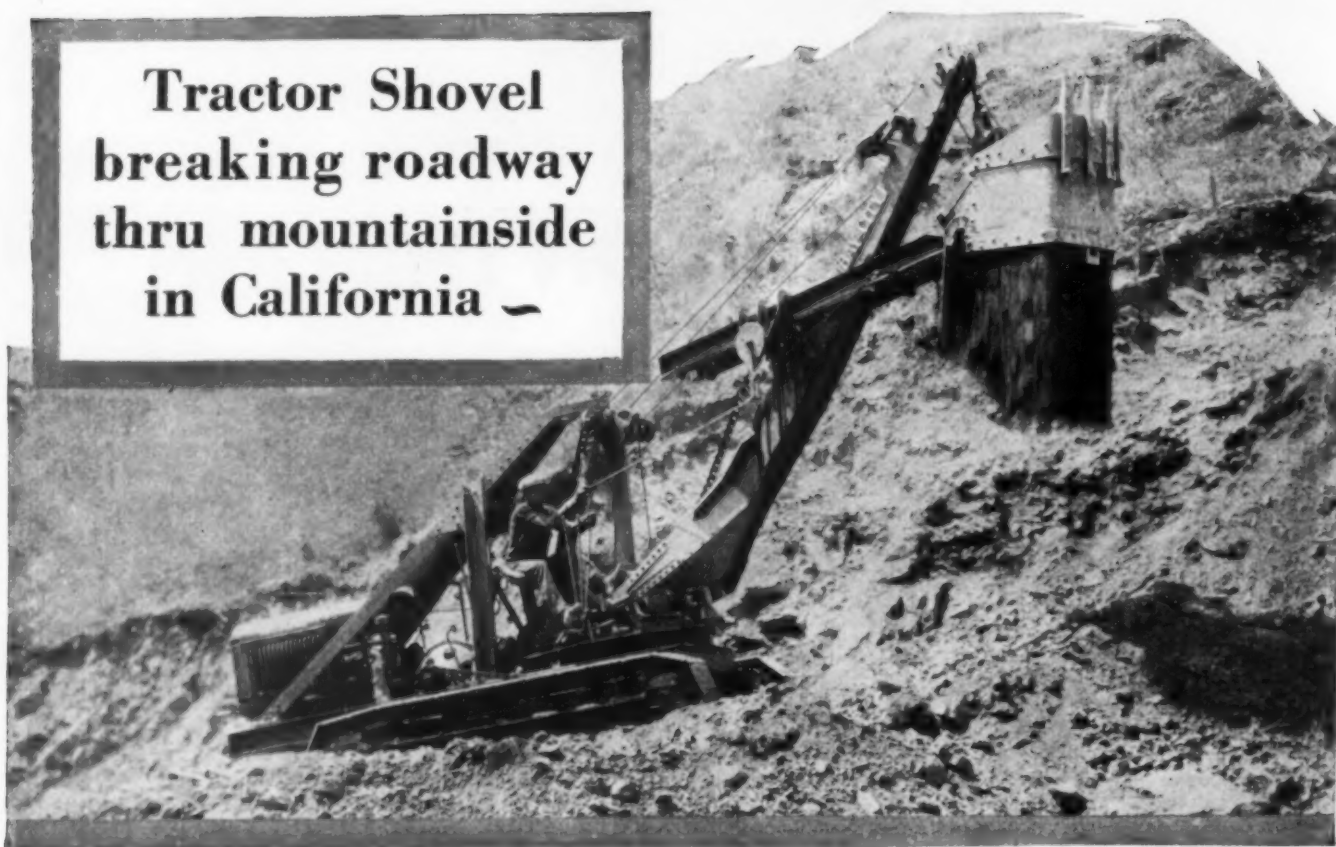
Factory, Morris, New York

New York City
 Skowhegan, Maine
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 Johnson City, Tenn.
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Canadian Linn Distributors: Mussen Limited, Montreal

Tractor Shovel breaking roadway thru mountainside in California —



This Tractor Shovel is helping build a new mountain road for fire prevention and control for the Los Angeles Forestry Department. When completed, the road will eliminate six miles of fire-break. Over the present trail it takes a ranger 1½ hours to reach the lookout tower on top of the mountain. On the new road it will take only 15 minutes.

The Tractor Shovel is breaking the roadway thru the mountainside—cutting thru the bank and casting over the lower side.

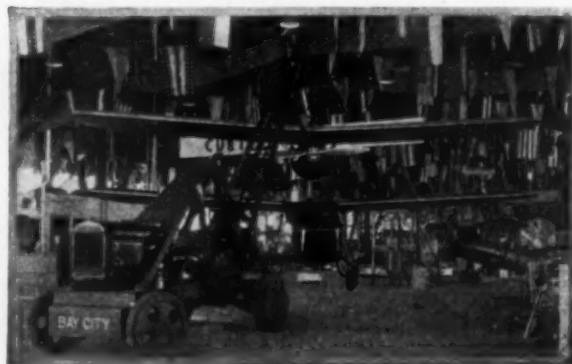
Tractor Shovels are saving time and money on hundreds of excavation jobs throughout the country. Highway boards of state, city, town and county, as well as contractors, have discovered that it pays to own and operate Tractor Shovels. 5 convertible attachments.

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BAY CITY SHOVELS, Inc.
BAY CITY, MICH.

Eastern Office: Roselle Park, N. J.

BAY-CITY SHOVELS
THE BAY-CITY FAMILY
OF FAST WORKERS



Cranemobile* Lifting Airplanes

This *Cranemobile** proved very handy at the annual National Air Show held in Detroit during April, 1931. It did a lot of heavy lifting work—assembling planes and exhibits, and transferring engines from one plane to another.

The photo shows it lifting an amphibian craft which weighs 3300 lbs.

This rubber tire mounted crane is suitable for any job where speed counts. Operates as Shovel, Crane, Dragline or Trench Hoe.

*Trade Mark Registered



Save time, money in tying bars

Even unskilled labor ties bars quicker this Bates way. Simply bend a Bates Wire Tie around the bars, hook the Bates Tying Tool into the looped ends and pull. The tie is tight, permanent. More ties per hour. Less cost per tie.

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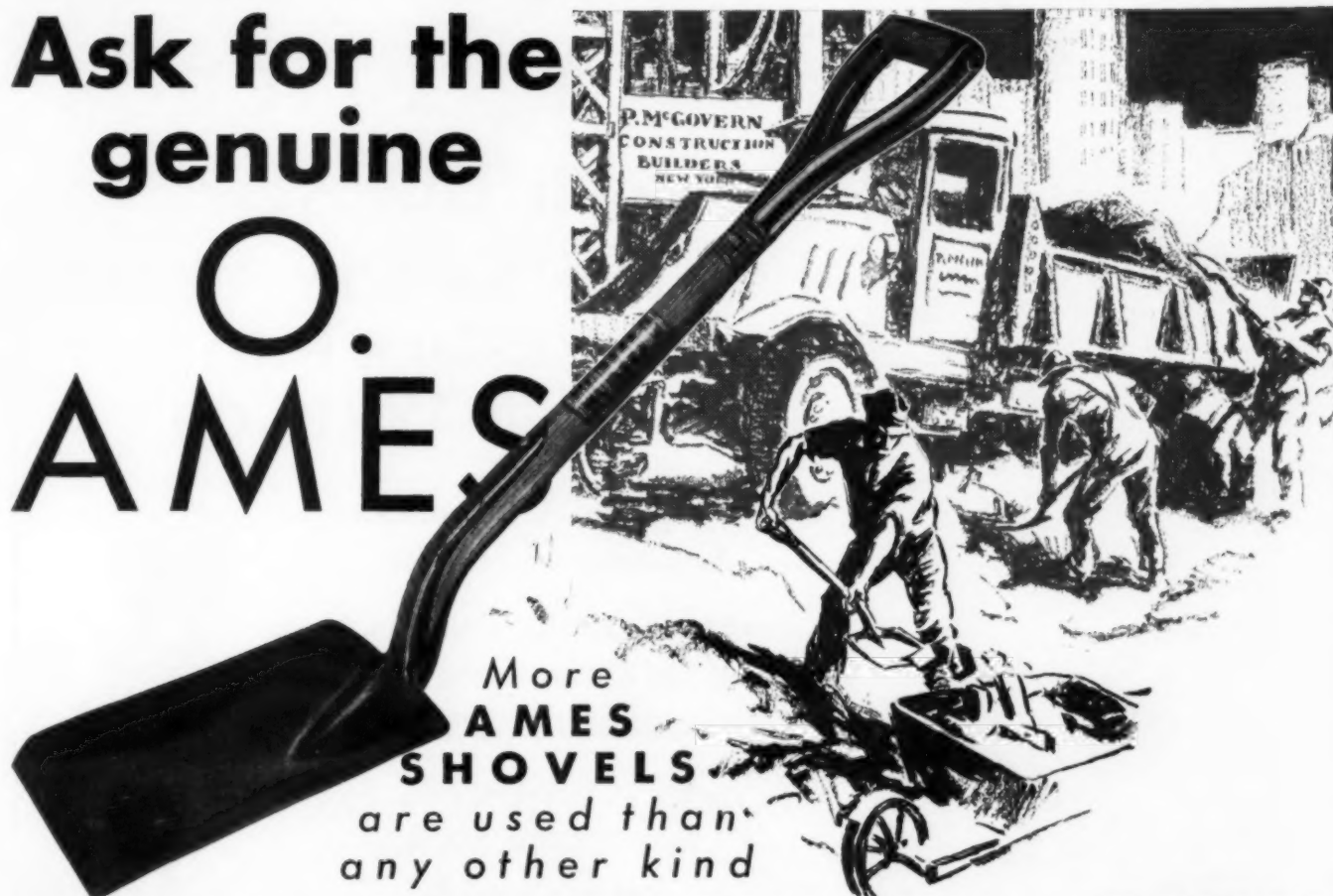


Wire Ties

Distributors in all principal cities

Ask for the genuine

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are used than
any other kind

AMES SHOVEL & TOOL COMPANY, NORTH EASTON, MASS. ♦ ♦ ♦ ANDERSON, IND.

You Can't Mistake a Toledo Torch for a tail light

It's a flashing orange flare.
Not only an unmistakable
warning, it illuminates the
danger spot.

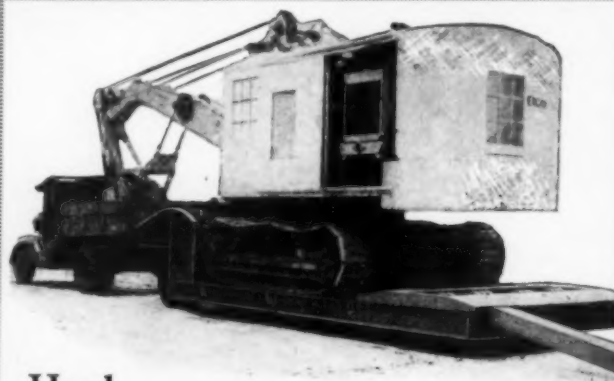
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The Toledo Pressed Steel Co.
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Manufacturers of The Toledo Horse—the ideal highway barricade



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USERS of the WILLIAMS "Arch-Girder" Trailer are
hauling *heavier pay-loads*—faster—with less gas.
Takes less time to load, and costs less to keep the trailer
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Get the facts on the *original trailer built for greater
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We Are Making Friends with This New LOWELL "SAFETY STEEL" 24" REVERSIBLE RATCHET SOCKET WRENCH



A Tested and Unconditionally
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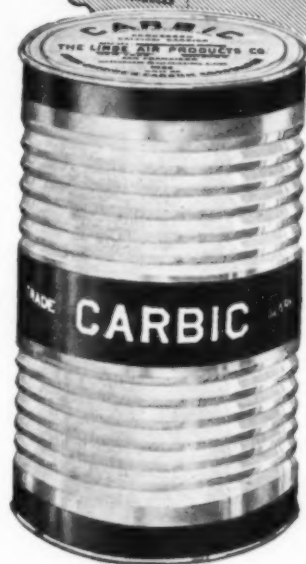
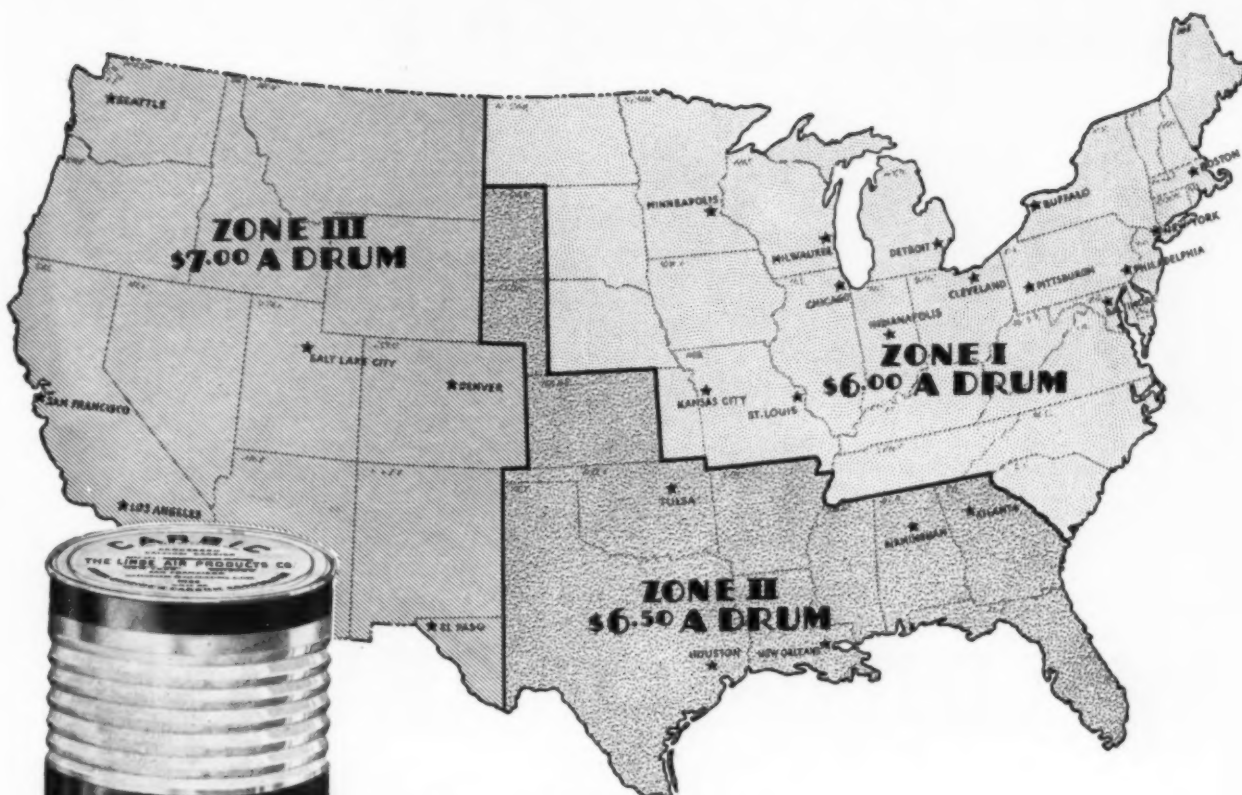
Capacity $\frac{5}{8}$ " to $1\frac{1}{4}$ " Bolt Dia. Nuts
($1\frac{1}{4}$ " to 2" Across the Flats)

Requisition for one today!

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WORCESTER, MASS.

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Carbic Advantages

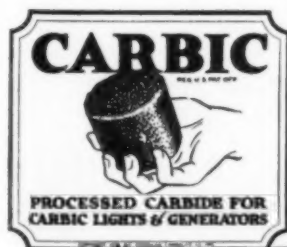
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3. Protection against air slacking
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5. Low pressure safety
6. Quickly available everywhere
7. Sold by most Jobbers or direct by us from the Union Carbide Warehouse stock nearest you

RECENT price reductions, totaling in most zones as much as \$30.00 a ton, make the many advantages of Carbic more attractive than ever.

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Carbic, made especially for Carbic Flood Lights and Generators, is an ideal source of portable acetylene. Every cake of Carbic is made of selected high-grade calcium carbide, carefully processed and wrapped in wax paper to assure maximum gas yield. Carbic will keep indefinitely in any climate until used. There is no deterioration, no loss.

Carbic is quickly available everywhere. You can order from your Jobber or direct from the nearest Linde District Office. From either source you will benefit from the new low Carbic price now prevailing in the zone in which you are located.



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and



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WELDING OF TRUSSES



"Our estimates are too high on this steel work. Where have we slipped?"



"We didn't slip in this case—we skidded by getting up against engineers, architects and contractors who know costs."



"But our costs aren't excessive."



"No, but our methods are. We figured on riveting. The others on arc welding."



"What have they saved by that?"



"They saved the job! They saved by having no gusset plates to figure on. They saved on shop labor. They saved on tonnage. They saved on less material handling. They saved having no punching. They saved on having less layout work."



"Those are real ideas—where do you get them all?"



"From my file of 'Studies in Structural Arc Welding', a service to architects and engineers by

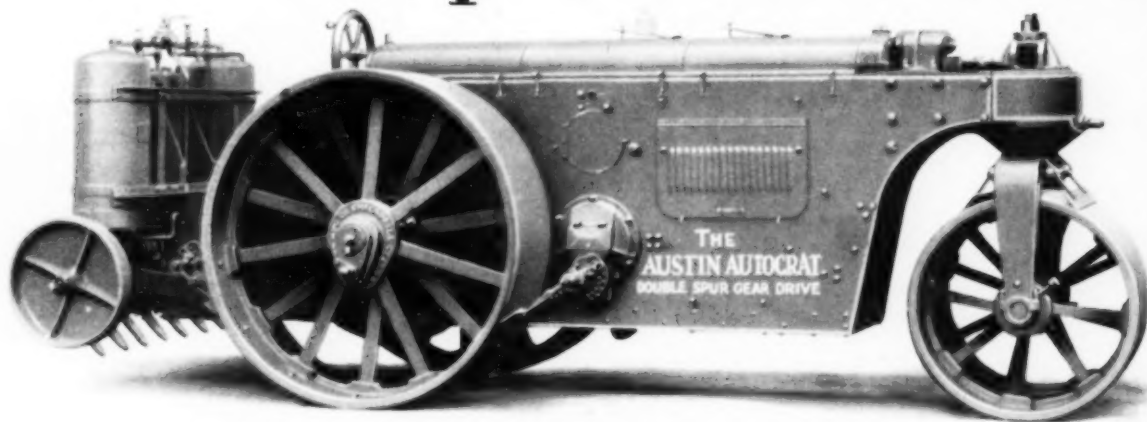
LINCOLN

THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO

Largest Manufacturers of Arc Welding Equipment in the World

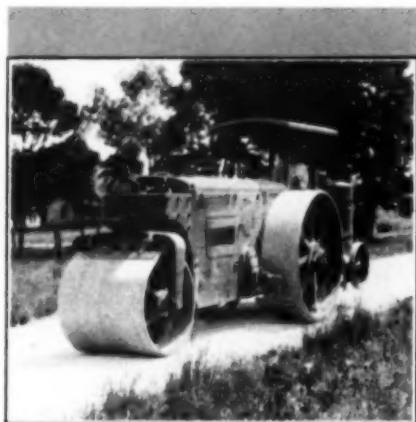
W-179

There's a practical reason



Double Spur Gear Drive Autocrat with powerful pneumatic scarifier

why every **AUTOCRAT** feature means better rolling results!



Autocrat with cab to protect operator



Autocrat with pneumatic scarifier at work on road

THE new Austin Double Spur Gear Drive Autocrat Roller has established the Autocrat name more firmly than ever at the head of the list of fine performing rollers.

No expense has been spared to make it the *finest roller in the world!*

The startling improvements and refinements found in the new Autocrat are but natural results of the *highest standard of material and workmanship* ever put into a roller. A higher *factor of safety* has also been obtained. The normal life of the new Autocrat is *years* beyond that of ordinary rollers.

Outstanding features

The new Austin Autocrat is now equipped with a double spur gear drive of *exceptional efficiency*. A differential gear is regular equipment on all models.

The heavy duty motor develops abundant power for rolling and the *toughest* scarifying jobs. An unusually short wheel-base increases maneuverability in close quarters. Amazingly easy to steer and handle! Low center of gravity *insures* smooth work and *prevents* side sway. Two speeds forward and reverse! Shifts from forward to reverse *without changing gears* or releasing master clutch!

Send for booklet

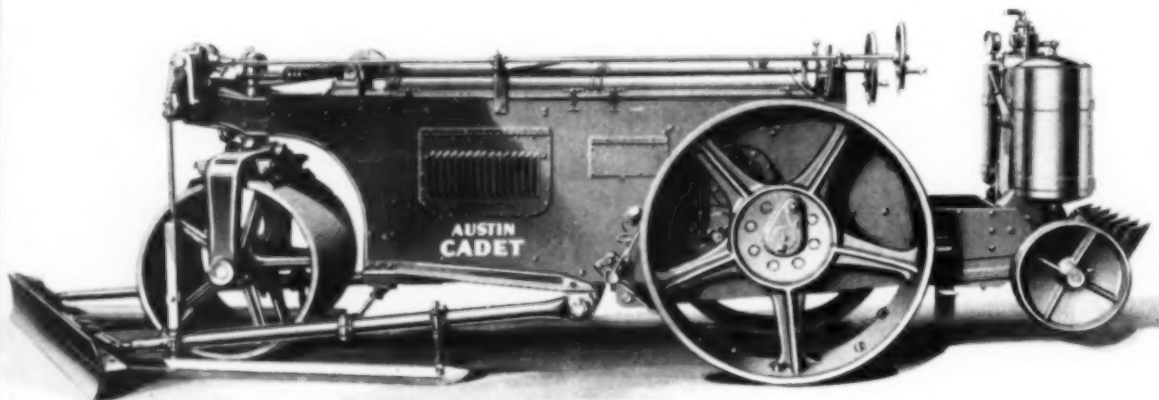
The Autocrat is made in 10- and 12-ton sizes. Write for descriptive literature for your files. The Austin-Western Road Machinery Co., 400 N. Michigan Ave., Chicago.

Austin-Western ROAD MACHINERY

AUSTIN-WESTERN ROAD MACHINERY COAST TO COAST



A completely factory-built roller



Austin 5-ton Cadet Roller with blade and pneumatic scarifier

... the AUTOCRAT of small-size rollers

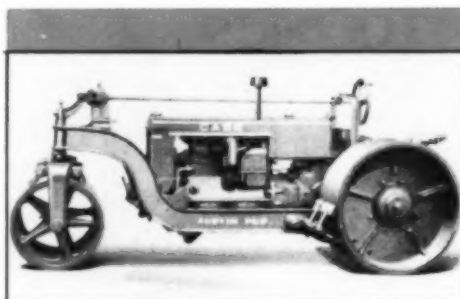
The Austin Cadet brings to the small, or pup roller field convenient operating features heretofore available only in the finest of the large rollers . . .

The special Cadet transmission has three travelling speeds forward and reverse—an impossibility when standard tractors are used for powering pup-sized rollers. The 4-cylinder, heavy duty motor can be cranked from either side, and provides more than enough power for rolling, leveling rough roads or subgrades, and scarifying hard surfaces.

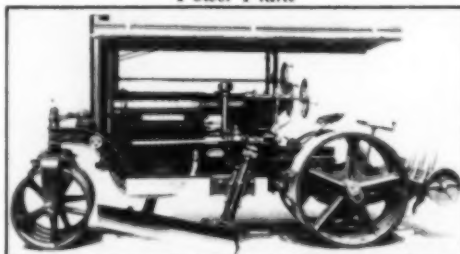
The Austin Cadet's wheel base is short enough to operate between the forms of concrete roads and other similar "tight spots." It is made in 5-, 6- and 7-ton sizes.

Streamline design gives the operator an unobstructed view of his work at all times. All sizes can be fitted with the famous Austin front planing blade as well as with a powerful pneumatic scarifier attachment.

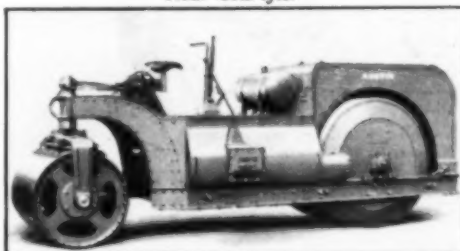
Other types of Austin rollers are illustrated at the right.



An Austin Pup Roller with a Case Model "CI" Power Plant



Austin Bull Pup Roller with Center Blade and Rear Scarifier



Austin 7-ton, 4-cylinder Tandem Roller

Write for complete information

THE AUSTIN-WESTERN ROAD MACHINERY CO.

400 North Michigan Avenue • CHICAGO, ILLINOIS • Branches in principal cities

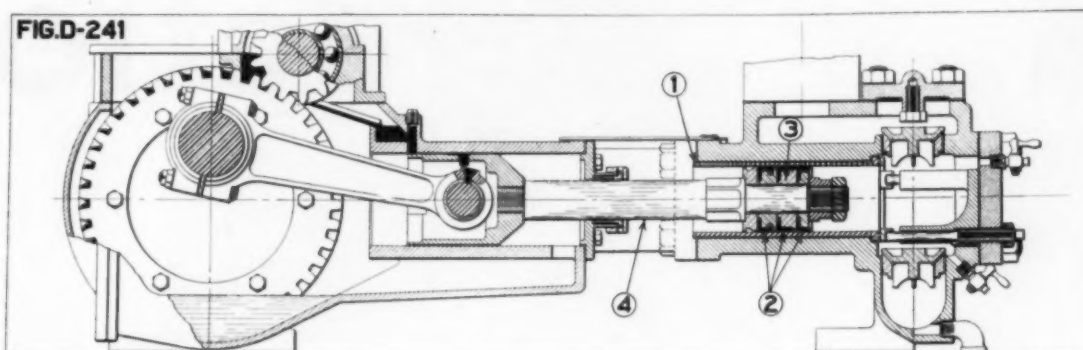
Leaning Wheel Graders, Straight Wheel Graders, Motor Graders, Elevating Graders, Crawler Dump Wagons, Scarifiers, Rock Crushers, Portable Conveyors, Rollers, Motor Sweepers, Street Sweepers, Sprinklers, Road Oilers, Hot Patch Portable Asphalt Plants, Plows and Scrapers.



Mr. Road Builder . . .

Take just a minute to investigate the construction of the New "Domestic" R-80 and R-125 Road Pumps

An old proven principle applied in a new way . . .



No. 1. REMOVABLE CYLINDER LINERS—

Available in 2 materials—

1. *Porcelain Lined*—Glass Hard and Abrasive Resisting.
2. *Nitrided Nitralloy*—Hard as the diamond.

No. 2. PLUNGER—3 high-grade Hydraulic Cups such as used in wells thousands of feet deep, where experience has proven they give years of life with absence of leakage.

No. 3. BRONZE PLUNGER FOLLOWERS.

No. 4. RUSTLESS STEEL PLUNGER RODS.

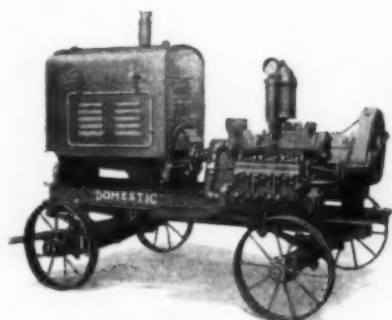
Why is this method of packing better than that usually found in Road Pumps?

Because the side pressure of cups against cylinder is controlled by pressure being pumped;—low pumping pressure, low friction on cups;—higher pumping pressure—just enough friction to prevent leakage.

The operator cannot tighten the packing more than necessary, nor is there a stuffing gland which can be drawn down unevenly thus pinching the plunger.

Result—Practically all the power of engine is available for pumping water instead of wasting a large portion overcoming friction—no attention to packing required of operator—hence longer runs without stoppage on account of packing.

The method of Cylinder Packing is only one of the many improved features incorporated in this new pump—bulletin RPU-31 describes it more fully—use the coupon for your copy.



"Domestic" R-80 and R-125 Road Pump Unit

THE pumps described on this page conform to specifications approved by the Board of Directors of the Associated General Contractors of America.

Domestic Engine & Pump Co.
Shippensburg, Pa.

Please send me Bulletin RPU-31 describing new "Domestic" Road Pumps.

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City

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DOMESTIC ENGINE AND PUMP COMPANY

MANUFACTURERS

SHIPPENSBURG, PENNA.



for
MAXIMUM
traction

Use FIRESTONE Ground-Grip Pneumatics

THERE are three special reasons why Firestone Pneumatics give greater traction. ▲ ▲ ▲ First, massive non-skid projections of tough, wear-resisting rubber that grip and hold. Second, greater contact surface of rubber. Third, deep-cut—self-cleaning treads. ▲ ▲ ▲ But maximum traction is only one of the important advantages. Firestone Pneumatics mean greater speed going to and from jobs. Lower repair costs on equipment because of the extra cushioning. Thus you get a worth while saving of working time and money. ▲ ▲ ▲ When purchasing new equipment, specify Firestone Pneumatics, Firestone Puncture-Proof Tubes, and Firestone Rims.



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GROUND GRIP PNEUMATICS

TIRES • TUBES • BATTERIES • RIMS • BRAKE LINING • ACCESSORIES

HAZARD MEETS EVERY CHALLENGE



The Challenge of Economy

Money saved in replacements means more for the payroll and profit column. The antiquated must be junked in favor of the efficient. Especially is this true of replacement purchases—and particularly in regard to wire rope. Wire rope in many industries is a big item of expense.

Hazard's answer to the challenge for greater economy in wire rope is Lay-Set Preformed Wire Rope. Lay-Set will outlast ordinary wire rope two, three and sometimes four times over. Less internal friction and wear—less surface wear—and ability to withstand fatigue due to continual bending stresses are the direct results of preforming.

No internal stress

In Lay-Set, wires and strands are pre-shaped so they lie side by side naturally . . . without straightening-out tendency. Cut Lay-Set Preformed Wire Rope. You need not seize the end. The fact that wires and strands stay in place is proof that internal stress is eliminated.



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LAY-SET

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Name and Position

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Wire Rope to be used for

C. M. 7-31



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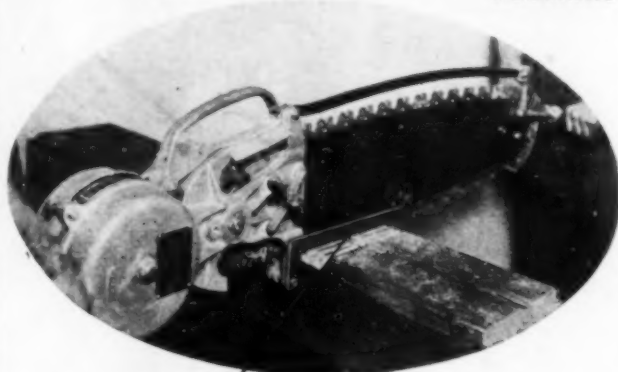
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C.M. 7-31

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**The Timber
Wolf**
Portable Sawing
Machine



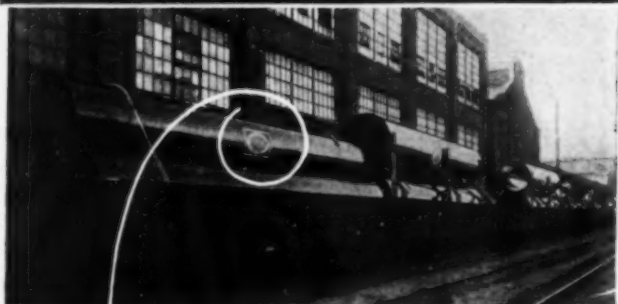
Showing the A. C. Electric Timber Wolf equipped with an adjustable gauge for notching, as in trestle work, bridge timbers, etc. A series of cuts are taken and then broken out with a chisel. On every timber sawing job, this fast, powerful machine cuts labor costs to a fraction. A.C. and D.C. Electric or Air Driven. Write for further information.

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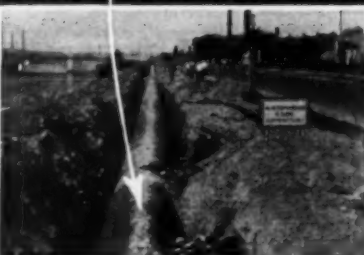
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Pipe comes to you exactly as you**

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Part-by-part inspection will prove to you the surpassing merit of Dodge Trucks. Or you can get your proof by actual test. Or you can rely on the recommendations of other business men who own Dodge Trucks and know from actual experience what they will do. » » And whether you use one or all of these yardsticks, you can be certain that exceptional value is guaranteed by Dodge resources. Resources that can be reckoned not alone in dollars. Or in dollars plus modern and efficient plants and equipment. Those are vitally essential, to be sure. But Dodge resources also include a still more important factor—the experience Dodge engineers and workmen have gained in the building of more than four hundred thousand trucks. Experience that assures you the modern design, precision construction and part-to-part balance that will be reflected in greater dependability,

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Detroit, Michigan

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CITY _____ STATE _____

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CALCIUM CHLORIDE Cured Concrete PASSES EVERY TEST!

One highway department after another has approved and is using this modern, efficient method of curing. The Highway Research Board and the Bureau of Public Roads report on it favorably.

This widespread approval was gained only after many miles of concrete pavements cured by Calcium Chloride were subjected to every known test for strength and hardness.

Competent engineers who made these tests agree that Calcium Chloride curing is fully as effective as the wet earth method; that it produces a hard wearing surface; that it eliminates risks involved in wet earth curing such as the careful placing of earth, constant sprinkling and competent inspections.

The new concrete can be opened for light traffic before it gains full strength because Calcium Chloride will continue the cure even though subject to traffic. Why not send the coupon today for complete information on this popular curing method?

Calcium Chloride Publicity Committee

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The Columbia Alkali Company, Barberton, Ohio
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Please send complete data on Calcium
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Trial orders prove so satisfactory that quantity orders for this unusual torch inevitably follow. You, too, will like Cleveland Flaming Torches. They give a full visible flame in all weather for as long as 48 hours. They stay where placed—are hard to tip over—can be hung up. Try them on your job.

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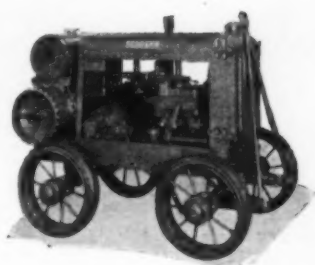
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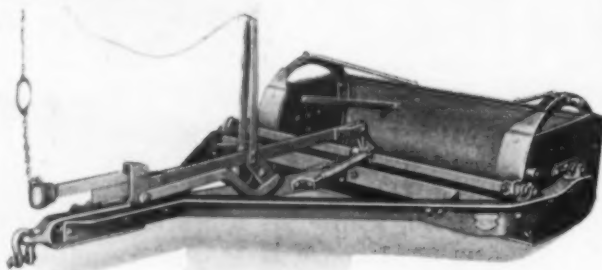
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